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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Immediate
November 1, 1961

Release No. 61-243

ADDITIONAL NASA ORGANIZATIONAL CHANGES

Additional organizational changes and appointments in the National Aeronautics and Space Administration were announced today by James E. Webb, Administrator, augmenting top-level organizational changes announced earlier. (See NASA Release No. 61-213). They are effective immediately.

In the Office of Manned Space Flight, headed by D. Brainerd Holmes, Dr. Nicholas E. Golovin has been named Director of Systems Engineering; Dr. Charles H. Roadman, Director of Aerospace Medicine; George M. Low, Director of Spacecraft and Flight Missions; Milton W. Rosen, Director of Launch Vehicles and Propulsion; and William E. Lilly, Director of Program Review and Resources Management.

Edgar M. Cortright becomes Deputy Director of the Office of Space Sciences, under Dr. Homer E. Newell, Director. In the same Program Office, Thomas L. K. Smull will direct the Office of Grants and Research Contracts; Donald H. Heaton will be Director of Launch Vehicles and Propulsion Programs; Dr. John F. Clark, Director of Geophysics and Astronomy Programs; John D. Nicolaides, Director of Program Review and Resources Management; and Oran W. Nicks, Director of Lunar and Planetary Programs.

In the Office of Advanced Research and Technology, directed by Ira H. Abbott, Newell D. Sanders will be the Technical Program coordinator. Harold B. Finger will be the Director of Nuclear Systems; John P. Stack, Director of Aeronautical Research; Boyd C. Myers II, Director of Program Review and Resources Management; Milton B. Ames, Jr., Director of Space Vehicles; Dr. Albert J. Kelley, Director of Electronics and Control; and Hermann H. Kurzweg, Director of Research.

Although a director of the Office of Applications has not been appointed, Morton J. Stoller has been named Deputy Director and will work with John Burke, Consultant to the Administrator, in organizing the office. Also in that office are Dr. Morris Tepper, Director of Meteorological Systems, and Leonard Jaffe, Director of Communications Systems.

Other appointments include Dr. John P. Hagen and Addison M. Rothrock as Associate Directors of the Office of Plans and Program Evaluation, and R. P. Young as Executive Assistant to the Administrator. Edmond C. Buckley as Director and Gerald M. Truzynski as Deputy Director of the Office of Tracking and Data Acquisition, will report to the Associate Administrator.

-End-

Sent to
House & Senate Space Committees

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: November 3, 1961
PM's

Release No. 61-244

NASA TO LAUNCH RECRUITING DRIVE

WASHINGTON, D.C., Nov. 3 -- The National Aeronautics and Space Administration today announced the start of a nationwide search for 2,000 talented scientists and engineers.

James E. Webb, NASA Administrator, said that this number of men and women who have science or engineering degrees is needed to staff the lunar program, nuclear propulsion research and development, space sciences, supersonic transport study, and numerous other aeronautical and space technology projects.

"All of our organizations will participate in the recruiting drive," Mr. Webb said. "Special teams composed of NASA scientists will visit virtually every area of the U.S. in coming weeks to interview candidates. I hope all qualified Americans will consider joining our NASA scientific effort so that U. S. goals in space technology can be met on schedule or earlier if possible."

He said that determination of additional personnel needs was coordinated with Administration leaders in their development of plans for achieving over-all economy in government operations.

All NASA centers throughout the country announced their specific professional personnel needs today at the same time Mr. Webb made his statement. The centers participating in the recruiting drive are: Ames Research Center, Mountain View, Calif.; Flight Research Center, Edwards, Calif.; Goddard Space Flight Center, Greenbelt, Md.; Langley Research Center, Hampton, Va.; Lewis Research Center, Cleveland, Ohio; Marshall Space Flight Center, Huntsville, Ala.; Wallops Station, Wallops Island, Va.; and the new Manned Spacecraft Center, Houston, Texas.

(over)

"Aerospace technology career opportunities with NASA offer interesting and important positions in research, development, design, operations, and administration," according to Mr. Webb. "Salaries range from $6,345 to $21,000 a year depending upon individual qualifications and experience."

The NASA Administrator said the agency is seeking "scientists and engineers at all levels who are interested in making a personal contribution to their country's space efforts. We are especially interested in meeting the recent science graduates who are just beginning their careers."

Personnel needs include scientists and engineers experienced in fluid and flight mechanics; materials and structures; propulsion and power; data systems; flight systems; measurement and instrumentation systems; experimental facilities and equipment; space sciences; life sciences; project management.

The NASA recruiting team, consisting of scientists from Headquarters and field centers, will be at the Sheraton Hotel in Chicago for several days beginning Monday, November 6, 1961.

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FOR RELEASE: Upon Presentation
about 1:00 p.m.,
November 14, 1961

RELEASE NO. 61-245

ADDRESS BY
JACK C. OPPENHEIMER, OFFICE OF PLANS AND PROGRAM EVALUATION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
TO THE ROTARY INTERNATIONAL ON THE OCCASION OF THE THIRD
ANNUAL LINCOLN AREA AEROSPACE SCIENCE CLINIC, LINCOLN, NEBRASKA
TUESDAY, NOVEMBER 14, 1961

SOCIO-ECONOMIC AND POLITICAL ASPECTS OF SPACE

An explanation of the title of this speech seems appropriate. Firstly, this was the subject I was assigned. Secondly, it is the implications of space activities for human affairs, not "space", "space technology" or "the National Space Program" about which I shall address you. Because, as you will note, I will not be talking very much about the physical environment of space or space science as such. Nor, will I be describing our total national space effort, which includes the important space responsibilities of the Department of Defense regarding missiles and reconnaissance satellites. In the words of the National Aeronautics and Space Act of 1958, which created the civilian space agency, I will be directing your attention to the socio-economic and policy implications of the Congressional declaration ".... that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind".

A recent newspaper cartoon depicted one of Queen Isabella's subjects saying to another, when discussing the estimated cost of Columbus' voyage into the unknown: "$26 thousand dollars!? .... Man could go to the moon for that!" Well, to mix a metaphor when talking about outer space, things have gotten more astronomical since 1492 in terms of the increased knowledge we have of the magnitude of the heavenly bodies inhabiting the Universe beyond our small planet and in terms of the costs of exploring interstellar space. The astronomers tell us that there may be as many stars in the Universe as there are grains of sand on all the beaches of all the oceans of our planet we call earth. And, perhaps 90% of the two billion stars in our Milky Way Galaxy, of which our solar system with its central sun-star is a minute part, have planets, many of which may be able to support the kind of intelligent life we know on earth.

In terms of 1961 dollars, it is estimated over the decade of the 1960's it will cost $35 billion dollars to explore and utilize the environment of space and the celestial bodies beyond our planet's atmosphere. Of this amount about 60% will go into the moon program. Approximately 85% of these funds will be spent under research and development and production contracts with private industry, universities, and other non-government organizations. For example, last Fiscal Year, NASA had program obligations of approximately a little less than one billion dollars. This Fiscal Year the resources for financing the program will be about one and three-fourths billion dollars. And, for the next Fiscal Year there have been unofficial figures published stating that the NASA budget will be on the order of three and one-half billion dollars.

Why should this audience of educators, business and professional people, and government leaders be concerned with the economic, social and political implications of space activities? I believe it is because the impact of man's peaceful or military operations in his solar system will, in reality, take place on his planet, earth. In unromantic fact, man-in-space is man grounded upon or connected to terra firma. As human beings we are concerned primarily with the socio-economic and political "why" and "how" of space activities. The scientific and technological "know-how" in which the physical and natural scientists and engineers are understandably pre-occupied is a fascinating means to social ends.

The technological and industrial revolution of which space science and exploration have become an integral part is moving faster than our mental and emotional capacities to cope with it. The pace of technological development seems to be and actually is more rapid and effective because of the contraction of the world by modern communication and transportation systems. With no more warning than the news announcement in between the TV soap operas and over the one radio in a remote village in Asia, the intercontinental ballistic missile is fired, the multi-megaton nuclear warhead is tested in the atmosphere, and the scientific, peaceful or propaganda spacecraft is orbited around the earth or the moon. The resulting technological, psychological, health, moral, political, and military consequences radically change the conditions of life on this globe.

Why should we go to the moon and the farthest reaches of outer space? There are compelling, scientific, technological, political, and economic reasons. In his May 25, 1961, State of the Union message, President Kennedy said:

> "Now is the time to act, to take longer strides -- time for a great new American enterprise -- time for this nation to take a clearly leading role in space achievement ... I believe that the nation should commit itself to achieving the goal, before the decade is out, of landing a man on the moon and returning him safely to earth."

Some of the reasons why the President urged this National commitment are:

(1) The United States of America is in a space race with the Soviet Union because we are in an across-the-board competition with every aspect of the Communist way of life. This involves meeting the international prestige challenge produced by the "neutral" and "new" nations and even some of our Allies acting as if the spactacular and

genuine technological space achievements of the Soviets are to be equated with a superior socio-economic, political, and military system. I refer to the USSR's sputniks, its successful orbiting of cosmonauts around the earth, and its shots at and photographs of the moon.

2. We must continue to demonstrate to all of the people of the world not only that a free society best preserves and develops human and natural resources, produces the most and best goods and services and provides the best way of life for its people. But, we must also show that our kind of techno-economic social system is determined to maintain the lead over the Soviets in the number of satellites placed into space, in the number of spacecraft transmitting useful scientific information about the space environment, and in the quantity and quality of knowledge of space science and technology we are sharing with other nations.

3. Unmanned and manned lunar exploration is only one step, even though an important stride forward in our space program. The moon, with its relative lacks of atmosphere and gravity may answer the questions of the origin and evolution of our life on our planet and provide a point of vantage from which to view and explore our solar system.

4. The knowledge and products created by space science and technology are of present and potential benefit to all mankind. Needs for new materials, metals and fabrics to meet conditions of the space environment and the demands of space technology have made possible the manufacture of novel products such as unbreakable plastics, high temperature ceramics and glass, electronic and miniturized medical and industrial instruments, new synthetic textiles, new fuels or power sources, and, in general, helped to establish new industries to employ our people and increase our gross national product and resources. If the kinds of ratios among expenditures, research and development, production and skilled and professional manpower in other and somewhat similar industries apply, direct civilian and defense space activities might well in time employ 750,000 to one million persons, with important indirect employment effects in many other manufacturing and service industries.

5. Presently emerging practical uses of earth satellite technology may well lead to improved communications and weather forecasting services. Such experimental programs as NASA's Project Echo (the "passive" or non-instrumented aluminized plastic balloon satellite many of you have seen pass overhead) have demonstrated that satellites can be used to reflect teleradio and TV signals. The experimental Project Relay will involve the launching of

"active repeater" satellites into space orbits between 3000 and 8000 miles altitude, which, with their electronic instruments, will relay messages from the earth and back down to the earth at the desired terminal points. An experimental project called Syncom will also involve "active repeater" satellites, but these satellites will be placed in 22,300 mile orbital altitudes around the earth's equator, synchronous with the rotation of the earth, so that they will be stationary with respect to any desired points on the earth. In addition, the American Telephone and Telegraph Company is designing and building communication satellites, at its own expense, for two experimental launchings and operations during 1962. NASA will furnish the launch, rocket, and tracking facilities, and will be reimbursed for the cost of these services.

Analyses have been made that show that when the much greater capacity of such communication satellite systems compared to conventional transcontinental and transoceanic teleradio and cable systems are fully utilized, these new systems should produce better and less expensive global communications than present methods. Some people have estimated that $100 million annual revenues will be generated in a period of 10 years after such communication satellite systems come into operation. The socio-economic and public policy problems yet to be resolved are illustrated by the recent report of the Ad Hoc Committee of international communications companies established by the Federal Communications Commission last July to recommend plans for a joint venture among the American Telephone and Telegraph Company and eight other smaller international teleradio and under-sea cable carriers for owning and operating a satellite communications system. This report brings out into the open in the most definitive form -- since the policy aspects of communications Satellites have been under discussion for about a year between government and industry -- the public policy issues for consideration and decision by the Federal Communications Commission and other government agencies such as NASA, the National Aeronautics and Space Council, the Departments of State, Justice and Defense, and, ultimately, the President and the Congress.

Some of the major public policy questions are as follows: If the President's stated national goal of furnishing global satellite communications means to serve points in nations around the world which have limited intra-national telephone and radio communications and which have none or inadequate international teleradio communication links with other nations, can such a private joint venture accomplish this foreign policy objective with a profit to the international combine and without government subsidy and ownership participation which would be vastly different from the usual government regulation of telephone and telegraph rates? Can such a consortium composed of one very large international communications carrier and eight other smaller international carriers operate in such a manner as to meet the President's policy conditions that there be no economic and technological domination which would stifle competition in violation of the anti-trust laws among the international carriers in providing satellite communication services and with respect to electronic manufacturers and telephone companies which are not international communication carriers but which wish to supply equipment and parts to such a large and complex enterprise? In view of the Cold War and the economic and political aspirations of the new nations which find themselves in between the powers of the free allied nations and the Communist bloc, will it be possible to allocate the scarce radio frequencies necessary for such global communications without establishing some different and international form of organization through the United Nations or otherwise and without vetoes or compromises which might or might not affect the economic and technological feasibility and adequacy of a communications satellite system?

With respect to the other social, economic and policy implications of such a satellite communications system, certain problems are to be considered: What will be the effect upon international travel for the businessmen and tourists who can conduct their commerce and view of foreign lands by international TV? Will voices in foreign languages with or without TV pictures and sub-titles be acceptable and understandable to international audiences composed of both highly literate and uneducated people? Will radio listeners and TV viewers be available at 3:00 o'clock in the morning or during working hours to benefit from and be customers for instantaneous, non-taped, broadcasts of national or world political, cultural or sports events?

NASA's meteorological or weather satellite program involves projects known as Tiros satellites I, II, and III which have made observations of and transmitted thousands of television pictures of the earth's cloud patterns and taken measurements of the heat of the earth and its atmosphere. These meteorological satellites are the first steps in aiding us to understand better the atmospheric processes which produce our weather and climatic changes. At present our meteorological observations from the earth and sounding rockets projected into high atmospheric altitudes only can provide us with about a 20 percent to 30 percent coverage of weather phenomena mostly from the underside of the atmosphere and space surrounding the earth rather than from the vantage point of outer space itself. For example, the Tiros experimental satellite cameras already have detected and transmitted pictures of cyclonic storms and hurricanes as much as a few days before hunter airplanes, ground-based radar and other conventional instruments could flash the warning signs to the weather forecasters for the saving of life and property. The experimental feats of the meteorological satellites may well augur the time when the increase in the rapidity and accuracy of short-range and long-range weather forecasting will lead to untold benefits to mankind in agriculture, commerce and tourism. Such improvements in weather forecasting and in knowledge about what produces our climatic changes may also have political and military implications for nations planning for the abundance of peace or the destruction of war. In addition, such meteorological satellites may aid eventually in bringing about reliable and large scale methods of weather modification and control.

With respect to the international political aspects of the space program, the National Aeronautics and Space Act of 1958 specifies that there be "Cooperation by the United States with other nations and groups of nations in work done pursuant to this Act and in the peaceful application of the results thereof". The NASA, in carrying out this statutory directive, has taken a variety of steps to obtain cooperation in our space program by countries all over the world. This cooperative participation has ranged from the exchange of scientists and scientific information, to the operation of tracking or data acquisition stations around the globe, and to the design and construction of satellite spacecraft and the scientific instruments and experiments to be placed in them. Approximately 35 to 40 nations are participating in or initiating cooperative projects with us in one or another aspect of this program. An additional method of international cooperation involves meetings and exchanges of information with private international scientific groups and organizations such as the Committee on Space Research of the International Council of Scientific Unions. This latter type of mutually beneficial international cooperation is an outgrowth of the successful private and governmental scientific cooperative programs during the International Geophysical Year, which took place in 1957-58.

However, it must be said, regretfully, that the Communist countries have not been as rapid or comprehensive in their sharing of scientific information as have other nations. Nor, has the Communist bloc suited its actions to its words of peaceful and scientific cooperation by its refusal to join in the deliberations during 1959 of the United Nations' Ad Hoc Committee on the Peaceful Uses of Outer Space. Subsequently, the Communist nations refused to organize for the first meeting of the permament United Nations Committee on the Peaceful Uses of Outer Space without imposing Troika-type veto formulas contrary to the rules governing United Nations Committee procedures. Fruitless negotiations to arrange for the first meeting of this important United Nations Committee have been going on since the passage of the United Nations' resolution establishing the Committee in December of 1959.

Nevertheless, Presidents Kennedy and Eisenhower and officials of their respective administrations have continuously invited the Soviet Union and the governments and scientists of all nations to join in a greater effort to make the fruits of the new knowledge about space available to all mankind. The most recent U.S. effort in this direction is the program our government has announced publicly it intends to propose to the United Nations to extend to all nations the benefits of exploring and utilizing outer space by preserving international peace, law and order in this new realm. The proposals in outline are as follows:

Explicit confirmation that the U.N. Charter applies to the outer limits of space exploration.

A declaration that outer space and celestial bodies are not subject to claims of national sovereignty.

An international system for registering of all objects launched into space.

A specialized outer space unit in the Secretariat of the United Nations.

A world weather observation system using earth satellites and other advanced techniques.

A co-operative program of research for ways by which man can start modifying the weather.

A global system of communications satellites to link the whole world by telegraph, telephone, radio and television.

A discussion of the socio-economic and political aspects of space activities should, I believe, indicate some of the impacts upon our educational system and the related and changing national beliefs and attitudes.

Controversies have existed about educational philosophies in our nation and our world over the ages. Most recently, during the 1930's there was a discernable shift from the emphasis upon the "three R's" in the direction of the so-called "social or life adjustment" philosophy. This trend continued through to the post World War II period, but with increasing resistance. Differences about our educational curriculum and system already had been manifested openly in the post war period. However, it took the impact of the supposedly backward Russians exploding of the atom and putting its energy to peaceful uses and into war-like threats and its placing of a Sputnik into space to dramatize the need for some long overdue actions as well as thoughts about U.S. educational philosophy and practice in a revolutionary world which would not let us adjust to the myth of a changeless American and world society.

The American people appear to have awakened to the need for the training of more and better physical scientists and engineers. For, the Soviet Union is producing scientists and engineers at a higher rate than the United States, whether of better quality is a significant question. Also, there is evidence of the accellerated progress of other nations in training wcientists in a variety of technological fields. The threats and pressures regarding Berlin and of Korean, Southeast Asian and African "small," "limited" and "guerrilla" warfare short of all-out thermo-nuclear war; the continuation of the cold war competition; and our admitted errors in assessing the capabilities of the Russians and other nations have confronted our system of beliefs, attitudes and education with an emergency.

Hence, the disputes about "social or life adjustment" versus increased academic courses of instruction may in truth be academic. What is required in fact is a supreme effort to teach in our schools and disseminate through our mass media of communications competence and even excellence of knowledge in the natural and physical sciences, mathematics, languages, literature, humanities and, last but not least, the social and behavioral sciences, in order to survive and to win in the across-the-board competition with the Communist bloc. How to accomplish this educational objective seems to this speaker to indicate the enrichment of course content and the motivation of students by bringing space events and related sciences into the classroom in order to stimulate interest in the pertinent academic courses.

The gauntlet has been thrown down by the authoritarian Communist societies, which, while rigidly thought and action controlled, are capable of great dynamism in such dramatic areas of nuclear energy and space. The National Defense Act of 1958 and other governmental educational grant or fellowship programs have reflected understandably the nation's preoccupation with its national defense requirements and the related inadequacies in the physical sciences, mathematics, technology and foreign languages. But, what of our other national needs in the social sciences, the arts, humanities, classics and English literature in order to recognize, analyze and deal with the ideological and psychological challenges to our democracy?

A variety of new careers have appeared to open up as a result of the international competition in the new sciences and technologies, especially the developments in astronautics and space activities. I suspect that the T.V. space-cadet programs and toy manufacturers have not lessened the predisposition of many of our children to be astronauts and space scientists rather than mere firemen or airplane pilots as in the dimly remembered days of the first half of the 20th century. It is significant, I think, that this

this generation of children is playing games, assuming roles, and formulating attitudes in preparation for adulthood on the basis of space experiences which actually haven't happened yet. This appears to be an innovation for juveniles who usually have directed their play and imagination to past or current experiences such as Cowboys and Indians, past wars, past and current criminal activities, adventures of all kinds and historical events in general. Perhaps this phenomenon will be instructive to parents, teachers, vocational advisers and personnel administrators in government and industry in realistically guarding against either <u>over</u> or <u>under</u> enthusiasm for the importance of the impact of space activities upon this generation of childrens' careers and human affairs in general.

Yet, it is true that many scientific and engineering skills are needed for our nation's space program. There will be needed physicists and chemists; electrical, structural and mechanical engineers; mathematicians and statisticians; geologists and astronomers; biologists and "agratomicists" (the last named are specialists created by the demands of the space-atomic age for determining radiation dosages which can be tolerated by living organisms); and many other scientific and professional people, including a variety of hybrids or combinations of these scientific, engineering and professional disciplines to deal with the new problems of the space environment. Thus, there will be needed new skills to meet the needs of new sciences and technologies; and there will be required new concepts, knowledge and vocabularies to be studied, understood and taught by new teachers, texts and visual aids.

The excellence of our space program depends upon the quantity and quality of the students educated by our elementary, secondary, undergraduate and graduate schools. This does not mean that our schools, colleges and universities should produce only "space scientists" and "space engineers." It should not be our purpose to concentrate on so-called "space science" at the expense of weakening our educational efforts in the other physical and social sciences. The program of space exploration and associated technology is and should continue to be an integral part of a balanced national effort in all science and technology and other fields of human knowledge. For, there is good reason to believe that our particular form of free society can prevail only to the extent that it integrates successfully the new physical sciences and technologies into its political-economy and its social, educational and national security system.

Most students entering secondary schools and colleges are not thinking of careers in science or engineering. Nevertheless, all students should acquire the understanding, appreciation and knowledge which will prepare them to cope adequately with the rapid changes of this technological age. The non-science oriented students do not need the highly specialized knowledge required by professional scientists. But, they should have enough familiarity with science, mathematics and engineering to comprehend the increasingly technological environment in which we live, and to acquire the basis to become trained or re-trained, if necessary, in the skill required to manufacture, operate or maintain the products of this technology. The liberal arts faculties have a great responsibility to aid the undergraduates to achieve basic understanding of scientific principles, methods terminology and the place of science in modern life. This is a difficult assignment, but science properly presented can be made a living part of a creative and fulfilling education. Interest in science can be made attractive and meaningful by utilizing the natural and enlightened self-interest of most persons in the exploration and the uses of the space environment for the welfare of themselves, our nation and all of mankind.

The properly stimulated or eager student scientist thirsts for knowledge in his chosen field of interest. Even as in the case of the non-scientist, the incorporation of space science and engineering courses into the regular curriculum can be made without weakening the basic science or engineering subject matter being taught. This is a strengthening process because of the stimulation and motivation which can and often does result. Thusly stimulated and motivated there may well be the desire to participate enthusiastically in required or elective scientific courses, which could in turn provide the momentum and sustaining force for students to undertake the long and hard work necessary to understand, appreciate and master such subjects as physics, mathematics, biology and chemistry.

Of course, just as the non-scientist student should have a basic understanding and appreciation of science and technology as they affect society, so should the science or engineering major be afforded the opportunity or be required to develop an appreciation for the social sciences, arts and humanities. Narrow concentration of study within any field of knowledge tends to beget a student and person deprived of the understanding required for a fulfilling and responsible life as a citizen and parent. In addition, the technological and social events in our contemporary world have moved us from an Anglo-American and Western-European orientation into a one-world attitude and position. This multi-national and scientific world requires that our educational system produce men and women equipped with the modern languages and mathematics which are the means of communication and understanding in a multi-national culture amidst a scientific and technological revolution.

Moreover, again it has been pointed out recently by such scholars as Lewis Mumford and others that the neglected appreciation and teaching of such social sciences as history and cultural anthropology have deprived us of tools with which to predict, plan and manage new scientific inventions and new technological developments. Examples of the utility of the study of such social and behavioral sciences are to be found in the need for military history to help meet current defense requirements and in the necessity in "disarmament" or "arms control" studies and conferences and inspection and control systems for highly trained technicians possessing knowledge and appreciation of the political and socio-economic factors as well as knowledge of the scientific and technological phenomena involved.

Our universities are placing more emphasis upon advanced study by college graduates. This is important because the need for graduate education in science and technology cannot be over-emphasized. Here the student is confronted with the border-line between the known and the unknown. Here he acquires the final preparation for a career in advanced research in science and in engineering.

The processes of scientific inquiry and education can best be carried on by associating research activities and classroom teaching wherever possible. Of course, this creates problems. Some great teachers of graduate students are equally eminent research people; other noteable scientists have as little as possible to do with teaching. High-grade industrial, university and governmental laboratories are separated necessarily to some degree from teaching as such. Thus, much scientific and other research is carried on without much connection to graduate education. Universities which receive grants or contracts from government and industry many times assign research projects to eminent and capable scientists who occupy themselves fully in attempting to achieve the desired technical objectives, leaving little or no time for teaching. Often universities either arrange faculty teaching assignments without reference to making time available for individual or group research activities or allow favored professors to take no teaching responsibilities whatever as a technique of attracting and keeping people of particularly outstanding reputation. Yet, it must be said that in the long run it is dangerous to separate research in any field of knowledge entirely from education. Obviously, the objective should be the attainment of a truly educational environment of inquiry, learning and teaching.

NASA and the many research and development organizations working in the space field require extremely high standards of scientific talent and engineering know-how. The nation's educational institutions are depended upon for personnel to man space programs and to conduct advanced research and development. Currently NASA has plans for contracts or grants totaling in excess of $20 million with over 60 different universities for advanced research and development activities. We are anxious to support space-related research efforts by universities. In addition, NASA depends upon qualified scientists and engineers in our colleges and universities for professional consultation and advice. Also, the participation of university faculty members in our programs as consultants and as directors of research projects provides for the up-dating of instructional material in a timely and efficient manner. The continuous re-writing of text material and classroom presentations is extremely important in fields of knowledge which are undergoing rapid change such as space science and technology. Participation of university faculties in new scientific and technological fields such as space is desirable for the stimulation and education of students to take leading positions in scientific research and development in the next decade and generation.

Elementary and secondary school teachers and the faculties in our colleges and universities face classes of young people who already are space conscious. These students wish to know more about the mysteries of outer space, and will in many school situations bring into the classroom the news headlines and stories on space activities.

Children born at the beginning of the space age will be embarked on careers in less than 20 years. Their juvenile impressions on space and its implications will have powerful impacts upon their attitudes and career choices. For children the now and the new are more real since there is less background experience with which to perceive and interpret current events. Thus, young students will consider ordinary what to us is perhaps revolutionary. Children are major carriers of change, both social and technological, because their eyes and ears and other senses are freed from the social restraints of adult experiences and beliefs so that they can bring fresh unfettered (yes, innocent) minds to new events and ideas. It can be seen readily that teachers and educational institutions which are training the future teachers of America have a space-age responsibility to be equipped properly to deal with young, uninhibited, inquiring minds.

Colleges and universities should be encouraged to support on-campus research; encourage participation of their key faculty members in government space activities; provide time for their qualified faculty to develop new classroom materials; and insure that teachers who are in the forefront of scientific and technological space programs have an opportunity to spend sufficient time with their students to truly educate and inspire.

In conclusion, I should like to complete the orbit around the subject of the socio-economic and political implications of space activities about which I have been rotating you. We have come back to Columbus where we started. It has been said that exploration is one of the moral alternatives to war. In a profound sense space activities may be one of the alternatives to war and geographic exploration on our planet. We are exploring space for new scientific knowledge which may help us to new understandings and solutions to our earthly problems. We will learn more about the celestial bodies and perhaps encounter life, intelligent or otherwise, which may inhabit other planets. We are on the threshold of using the space environment and space technology for global communications and weather forecasting, and for expanding our national and world resources and economic productivity. The threat of the total destruction of life on this small planet by nuclear weapons may be replaced by the necessity of mankind to meet the challenges of other worlds.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.

TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Sunday
November 12, 1961

RELEASE NO. 61-246

BIOS I

One of the most interesting and vital areas of space exploration is the effect of radiation (high energy protons) and weightlessness on living matter. And, the best laboratory in which to study these effects is space itself.

Within a few days--on or about November 15--the National Aeronautics and Space Administration will attempt to launch a recoverable space vehicle containing living organisms on a flight through the Inner Van Allen Radiation Belt. The flight, to an altitude of about 1,165 miles, also will provide exposure to prolonged (about 25 minutes) weightlessness.

The launch will be from the Pacific Missile Range, Point Arguello, California. A four-stage Argo D-8 solid rocket, which is about 62 feet tall and provides about 130,000 pounds thrust will be used to launch the 136-pound space vehicle.

Called BIOS after Biological Investigations of Space, this is NASA's second major launch from the Point Arguello launch site. A similar solid propellant rocket, part of the successful NERV program (for Nuclear Emulsion Recovery Vehicle) was launched there in September, 1960.

Scientific objectives of the BIOS program are to discover the effect of radiation on a variety of small organisms, and to study how zero gravity effects the growth rate of ameobae cells, fertilization and cell division of sea urchin eggs and the production of microspheres. In addition, the spacecraft carries an experiment to chart radiation with respect to intensity, geographic location, and magnetic fields, using a nuclear emulsion.

BIOS also carries a micrometeoroid experiment to record impacts of extraterrestrial matter. With this experiment, it may also be possible to recover tiny particles of matter for analysis and perhaps determination of their origin.

BIOS is under the overall management of Charles E. Campell, NASA Goddard Space Flight Center.

Launch date and time for BIOS is set so the spacecraft will intercept a meteoric stream of particles in order to make full use of the micrometeoriod experiment. The particles are in the Leonids meteor stream, the decay of a comet in 1866.

BIOS is designed to accomplish its goals at relatively low cost. Two complete flight systems, including launch vehicles, spacecraft, and support equipment - plus a back-up spacecraft, are ready for use in BIOS. This hardware is surplus from the NERV Program, since the research goals of NERV were completely achieved on the first flight. The launch vehicles cost about $150,000 each. The spacecraft cost about $200,000 each.

NASA centers and contractors cooperating in the project are, NASA Goddard Space Flight Center - Project Management, Physical Science Experiments, and Contract Administration; NASA Ames Research Center - Bioscience Experiment; NASA Marshall Space Flight Center - Launch, Tracking and Recovery Operation Management; Pacific Missile Range, Naval Missile Facility, and U. S. First Fleet - Launch, Tracking and Recovery Support; General Electric Co. - Spacecraft and Bioscience Experiment; Aerolab Development Co. - Rocket Vehicle; Thiokol Chemical Co. and Army Ordnance Missile Command - First Stage Rocket Motors; Allegany Ballistic Laboratory and Navy Bureau of Weapons - Fourth Stage Rocket Motor; Florida State University - Bioscience and Microsphere Experiments; Oak Ridge National Laboratory and Argonne National Laboratory of the Atomic Energy Commission - Bioscience Experiments; University of Zurich, Switzerland, Bioscience Experiment; and Elgin Micronics - Device for Micrometeorite Experiment. Spacecraft integration was accomplished at the Ames Research Center.

BIOS I SCIENTIFIC EXPERIMENTS

Experiments in the BIOS spacecraft are of two types: bioscience, and physical science. Bioscience experiments are divided in two subgroups: radiation effects and zero gravity effects. The NASA Ames Research Center, with Dr. R. S. Young as systems manager, has responsibility for the bioscience experiments. Physical science experiments with Donald Kniffen and Otto Berg as system managers, are the responsibility of the NASA Goddard Space Flight Center.

The biological experiments are designed to make use of two unique aspects of the space environment--sub-gravity and Van Allen type radiations--as fundamental research tools. A variety of radiation sensitive biological materials are included in the payload to be studied upon recovery for genetic and cellular damage. Such information will be of importance to manned space flight but the experiments are primarily designed to use the space environment for research purposes.

Bioscience Experiments - Radiation Damage

Three experiments by Dr. A. Gib Debusk, department of biological sciences at Florida State Univerity, are genetic studies, using the mold neurospora. The first is designed to detect mutation of genes controlling steps in metabolism, survival or death, and physiological injury resulting in a loss of ability to initiate the growth process. The second is a back-mutation experiment, which will measure mutation after exposure in terms of population and tendency to revert to another form. The third will indicate the frequency with which lethal mutations are produced in the specimens by radiation.

A series of experiments is planned to determine "Survival and Mutation in Neurospora Conidia" by Frederick J. deSerres, biology division, Oak Ridge National Laboratory.

Howard I. Adler, biology division, Oak Ridge National Laboratory, will conduct an experiment concerned with "Determination of Viability of a Radiation Sensitive Bacterium." A bacteria commonly found in human intestines, will be exposed for later analysis as to its capability to grow and develop normally.

Using human blood, an experiment by Michael A. Bender, biology division Oak Ridge National Laboratory, will investigate "Natural Radiation Effects on Human Chomosomes." The blood will be drawn as soon as possible before launch; the exposed samples will be studied as soon as possible after recovery for chromosome damage.

An experiment to determine the "Influence of Space Environment on Chomosomes of Grasshopper Neuroblasts," will be conducted by Mary Ester Gaulden and R. C. von Borstel of the Oak Ridge National Laboratory, biology division. Because it is known that the large neuroblast, a nerve fiber in early stages of development in a partially hatched grasshopper egg is extremely sensitive to radiation, these neuroblasts will be exposed to space radiation, then "fixed" three to eight hours after exposure. Analysis will show how chromosomes in the cells were broken or damaged due to the radiation.

James A. Eugster of the Universities of Bern and Zurich, Switzerland, is participating in the BIOS program with an experiment using the seed from a special strain of barley known as Hordeum Bonus B19, which has been studied for its reactions to irradiation for several years. A complete follow-up analysis of mutations in descendants of the exposed seeds will be made.

Bioscience Experiments - Zero Gravity Effects

The study of behavior of liquids under zero gravity conditions is of interest to the biologist because living cells are, for the most part, fluid. In an experiment to investigate "Production of Microspheres at Zero Gravity," Sidney W. Fox and Kaoru Harada, Florida State University, will find out what effect zero gravity will have on the formation of microspheres which compare in size and shape to bacteria.

One of nature's strangest "time clocks," the giant amoebae Pelomyxae Carolinensis and Pelomyxea Illinoisensis, reproduces by cell division, during which the nuclei all divide at exactly the same time. Because of this natural synchronization, and because the amoebae are known to be virtually immune to radiation damage, they are an ideal means of detecting "Effects of Subgravity and Rapid Position Change of Plasmotomy" in an experiment by Dr. D. R. Eckberg of the General Electric Co., and Dr. Edward W. Daniels of the Argonne National Laboratory.

Results of the experiment will show how the amoebae's regular growth rate and life cycle is affected by weightlessness, acceleration forces, and rapid change in geographical position. During the flight, the amoebae will be maintained in an environment that is as near normal as possible.

In the "Sea Urchin Experiment" by Dr. Richard S. Young of the NASA Ames Research Center, a biological system has been designed which can be activated and stopped during the near zero gravity phase of the flight. With this experiment, two questions of fundamental importance may be answered: (1) Does the absence of gravity have any effect on fertilization? and (2) Does the absence of gravity have any effect on cell division?

The effect of near zero gravity on basic cellular processes such as fertilization and cell division is of great interest and importance to biological investigations in space. A single cell division in the sea urchin egg is completed in 1 - 2 minutes, and the BIOS mission is expected to produce about 25 minutes of weightlessness. Thus, the entire experiment may be begun and ended during that phase of flight, with simultaneous in-flight and ground control.

The sea urchin egg is a readily available research material with the distinct advantage of offering a biological system which can be activated at will by introducing sperm to the egg. When the fertilization reaction is initiated, the egg proceeds to divide in an orderly and clock-like way. A capsule has been designed which will trigger this reaction on signal, on the launch pad, or at the onset of zero gravity. Those triggered on the launch pad are designed to test the effect of weightlessness on cell division. The first division of the egg will occur 50 minutes after fertilization, so the sperms are injected into the egg suspension in the vehicle on the launch pad at 48-49 minutes before weightlessness occurs. At the end of the zero gravity phase of flight a fixative will be injected into the capsules on signal, killing the cells for study upon recovery. Another series of capsules will be triggered at the onset of weightlessness to study the fertilization process, which occures in 1-2 minutes.

Physical Science Experiments

Donald A. Kniffen, Space Sciences Division of the NASA Goddard Space Flight Center, is responsible for a "Nuclear Emulsion Experiment" as a tool to explore characteristics of Inner Van Allen Belt radiation and assess its hazards to biological systems. The nuclear emulsion, like ordinary photographic film, consists of silver bromide grains embedded in gelatin. It differs from ordinary film in its greater thickness and higher percentage of silver bromide. Because of its thickness, almost two weeks is required to process the emulsion.

The emulsion records the passage of any charged particle which has enough speed to penetrate. Processing the emusion provides a permanent record of the number of particles, their charge, mass and velocity, and the direction in space in which they were traveling with relation to the emulsion. This is the information required to map out the radiation around the earth. If biological specimens are exposed at the same time, the effect of radiation on these specimens can be related to the dosage as recorded in the emulsion.

Protons above an energy of eight million electron volts, and electrons above an energy of 100 thousand electron volts will be detected. The experiment is essentially the same as that performed in the NERV program conducted in September 1960.

The "Micrometeoroid Experiment" by Otto E. Berg, Space Sciences Division of the NASA Goddard Space Flight Center, is part of a major NASA research effort on investigations of extraterrestrial dust and the study of craters produced by hypervelocity microscopic particles. Except for meteorites, no certain samples of extraterrestrial dust exist. Similarly, crater studies from hypervelocity particles are limited to those from meteorites which have penetrated to the earth's surface, or to recent laboratory studies of craters formed by particles having velocities only as great as that of the slowest micrometeorite velocities.

Recent measurements from the satellites Pioneer III and Explorer IV show that large increases in micrometeoroid densities occur during annual meteor streams. The BIOS launch on November 15, 16, or 17, is timed to place the spacecraft in one of these predicted meteoric streams.

The micrometoroid experiment, using a carefully prepared cylinder of lucite plastic, is designed to record and recover positive evidence of impacts. It is possible that sufficient micrometeoroid debris will be recovered from the lucite to warrant analysis for a better understanding of their origin. The cylinder will be subjected to crater analysis as a means of learning more about the impacting particles. The lucite sleeve is photographically scanned just before flight, then extended outside the spacecraft from altitudes of 200 to 600 miles. Photographic scanning after the flight will reveal micrometeoroid impacts that occurred during the exposure.

MISSION - SUBSYSTEMS

The BIOS experiments carried in an aerodynamically stable reentry-recovery vehicle will be launched to an altitude of about 1,165 statute miles and a range of over 1,000 statute miles. In addition to the biological and micrometeoroid experiments the spacecraft carries within its heat shield and basic structure two major subsystems - the emulsion subsystem and the recovery subsystem.

Functioning of the subsystems during flight is timed and initiated by a programmer unit which uses G-forces and time delays to start and stop emulsion exposure, trigger biological experiment events, despin, activate recovery circuits and separate the recovery vehicle from the adapter. Events after separation are programmed by a recovery controller which also uses time delays and G-forces to deploy a parachute, eject radar chaff, activate the radio beacon and flashing recovery light, and separate the parachute after impact.

Altitude	Time	Event
125 St. Mi.	99 sec.	Fourth stage burnout
200 St. Mi.	1 min. 55 sec.	Despin-expose emulsion
215 St. Mi.	1 min. 59 sec.	Inituate sea urchin experiment
400 St. Mi.	24 min. 28 sec.	Retract Emulsion end sea urchin experiment
375 St. Mi.		Separate 4th stage booster and adapter
76 St. Mi		Start reentry
35,000 Ft.	27 min. 12 sec.	Parachute deployment Radar chaff ejection Chaff beacon transmits.
0 Ft.	37 min. 12 sec.	Water impact Parachute cut-off Dye emission Flotation Chaff beacon transmits

The recoverable part of the BIOS spacecraft is an acorn-shaped capsule with an ablation type heat shield. It is 19-inches in diameter and about 17 inches long. The adapter is a 19-inch diameter cylindrical section about 29-inches long. It contains a C-band radar beacon for tracking. Design weight of the complete spacecraft including adapter is 136 pounds at liftoff. The recovery vehicle alone weighs 86 pounds at reentry, and 73 pounds at impact and flotation.

Stabilization and control is provided by fins in the first three of the four stages. The fourth stage is stabilized by gyroscopic forces from roll induced by canted third stage fins. The spacecraft is attached to the fourth stage and will be despun at 120 seconds. The motion of the spacecraft after should result in a near zero gravity condition. Immediately before reentry, the recovery vehicle will be separated from the fourth stage and given a small initial tumble.

The spacecraft will be assembled and checked out by General Electric Company's Missile and Space Vehicle Division, and NASA Goddard Space Flight Center personnel at Vandenberg Air Force, California. In addition, a prototype spacecraft will be assembled by GE-MSVD and instrumented by NASA Ames Research Center, and placed at the launch pad to provide a temperature monitor and reference for the biological experiments mounted in the actual flight payload.

Installation of the experiments in the payload will be by GE-MSVD and the individual experimenters. All experiments with the exception of the sea urchin eggs, will be installed between T-12 and T-10 hours. Due to the critical life cycle of the sea urchin eggs, this experiment will be installed at T-7 hours.

LAUNCH TRACKING AND RECOVERY

Launch Vehicle

The Argo D-8 is a four-stage, unguided, solid propellant rocket designed by the Aerolab Development Corp. It is 62 feet long and weighs about 14,000 pounds. The rocket motors are:

First Stage - Thiokol TX 20 Sergeant motor with a pair of smaller Recruit rockets.

Second Stage - Lance XM-33 rocket motor by Grand Central Rocket Co.

Third Stage - Lance XM-33 rocket motor by Grand Central Rocket Co.

Fourth Stage - Allegany Ballistics Laboratory X248-A6 motor.

The vehicle is fin-stabilized for the first three stages. The fourth stage is spin stabilized by induced roll from the fins on the third stage. Burnout velocity (99 seconds after liftoff), is more than 17,000 feet per second or about 11,500 MPH.

Launch

The Argo D-8 rocket is assembled by the Launch Division of the Pacific Missile Range at the Naval Missile Facility, Point Arguello, Calif., under the technical supervision of the NASA Wallops Station, Wallops Island, Va. with technical consultation and assistance by the Aerolab Development Corp. The flight vehicle and a back-up vehicle were prepared simultaneously at Point Arguello.

Proper aiming of the launcher is an important aspect of the launch phase. Since the Argo D-8 is an unguided vehicle, accurate compensation must be made for wind effects on the vehicle. Correction techniques developed by Robert L. James, Jr. of the NASA Langley Research Center and successfully applied to the Argo D-8 in the NERV program will also be used on BIOS. These corrections are based on many simulated computer flights of the Argo D-8 in various wind profiles to establish vehicle response to winds. The Pacific Missile Range provides detailed weather information for applying wind corrections.

Launch time for the BIOS will be chosen to coincide with first light at the impact area. The early hour will enhance the probability of having calm wind conditions at the launch site. In addition, a dawn launch will give recovery forces an opportunity to spot the glow of the spacecraft as it enters the earth's atmosphere.

In Flight

The BIOS vehicle will be tracked by Pacific Missile Range radar units until well after last stage burnout. If the operation is normal, first impact prediction from a computer at PMR will be available to the recovery force five minutes after liftoff.

Recovery

The Commander, U. S. First Fleet, is responsible for the recovery operation. The recovery group Commander, Capt. E. P. Rankin, with assistance of an advisory group of representatives from NASA and the PMR, will have a recovery force of three recovery ships from the First Fleet, two search aircraft from the PMR and two helicopters at the predicted impact area.

The ships are:

The USS Pine Island, a seaplane tender, Capt. Rankin; USS Benner, destroyer radar picket ship, Cdr. J. B. Drachnik; USS Everett F. Larson, Destroyer radar picket ship, Cdr. D. V. Schermerhorn, and the Ranger Tracker, a PMR instrumented range ship.

The aircraft should receive the BIOS recovery beacon signal about 27 minutes after rocket liftoff. During practice runs the aircraft have been able to home on the signal from a range of 150 nautical miles. After locating the payload the aircraft marks the location with smoke flares and directs the nearest recovery ship to the recovery area.

After recovery, the payload will be transferred to the command ship where project scientists will remove the experiments. The ship is equipped with laboratory equipment necessary to accomplish preliminary processing of time-dependent bioscience experiments. The recovery force will return to San Diego in about three days. The experiments will be returned to the experimenters and the reentry vehicle will be returned to General Electric MSVD for analysis.

Backup Vehicle

In order to take full advantage of the availability of the recovery forces, a second launching is planned in the event the first fails. The second launching would be made about 48 hours after the first. The Project Manager will determine the necessity of using the second vehicle within six hours after the first launching.

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NEWS RELEASE

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Luncheon Address by
James E. Webb, Administrator
National Aeronautics and Space Administration

THE EXECUTIVES' CLUB OF CHICAGO
Chicago, Illinois
November 10, 1961

* * *

"U.S. Space Policy and Implementation: 1961"

Just two weeks ago today, the initial test-flight of the first stage of the giant Saturn booster was launched from Cape Canaveral.

The test was a great success.

Millions of Americans -- including, I am sure, many of you -- saw it on television, as I did, and must have had the same sense of pride I felt. It was awe-inspiring to watch that great vehicle, balanced on top of its pillar of rocket flame and smoke, accelerating smoothly and vanishing in the sky.

The flight soared nearly 85 miles above the earth's surface and reached a peak of 3,590 miles per hour. The vehicle came down in a little less than eight minutes in the Atlantic, 215 miles downrange from the Cape.

We plan nine more test launchings during the next several years to prepare Saturn for its first mission -- the orbiting of a three-man spacecraft around the earth as the initial operational step in Project Apollo, the U.S. program for manned flight to the moon.

Some of the facts related to the test are as impressive as the flight itself. The eight engines clustered to make up the first stage delivered about 1,300,000 pounds of thrust at lift-off. Translated roughly, it amounted to about 28,000,000 horsepower or the full power potential of more than 100,000 standard 1961 automobiles. This power was delivered in a little under four seconds of burning time.

On the launching pad at the Cape, Saturn stood 162 feet high, 10 feet taller than the Statue of Liberty. Dummy second and third stages, filled with water, were mounted above the first stage to simulate the dimensions and weight of the Saturn combination when its development is complete. The vehicle weighed about 460 tons at lift-off, of which 300 tons was kerosene-liquid oxygen fuel and oxidizer.

The Saturn flight was a major milestone in our national space effort. On May 25, you recall, President Kennedy recommended to Congress a speeding-up generally of the program. The key objective is to achieve undoubted mastery in space exploration, with emphasis on using American astronauts for scientific explorations on the moon.

Congress endorsed the national program and appropriated $1,671,750,000 for NASA's Fiscal Year 1962 activities. It is important to recognize that the program was presented by the President and handled by the Congress in a completely bipartisan or non-partisan basis.

Funds were included to accelerate development of large rocket engines and space vehicles; for speeding up exploration of the environments of the earth, the moon, and the space between; to expedite the Rover nuclear rocket engine; and to expedite the development of weather and communication satellite systems.

May I emphasize that 80 cents out of every dollar NASA spends goes for contracts with industry and private organizations, for materials, supplies, salaries, research, development, and many other services.

The 1962 program is approximately twice the size of that for 1961. We expect funding requirements to double again in 1963 if we are to meet our national goals.

There are many urgent reasons why this country has decided to invest heavily in this long-term program to win space supremacy. If the Soviets decisively outstripped us, their space technology would be used to develop their total national capability and to apply pressure on us and other Free World nations.

This we cannot permit. It is not in our national character to be bystanders in this vast and dynamic new venture that promises to return such a wealth of practical benefits to our country and to all men. Moreover, we cannot allow our international standing in science and technology to slip to second place. There is strong evidence that in the eyes of the world space achievements have come to symbolize over-all accomplishments in science, technology, and national progress.

These are among the chief reasons why the nation has decided to go to the heart of the matter -- to marshal our resources with fixed determination to achieve first place in manned exploration of the solar system and to meet its challenges, whatever they may be.

Project Mercury, the first phase of the United States program for manned space flight, will place an astronaut in orbit around the earth. We will learn how man can withstand prolonged weightlessness, how well he can pilot a spacecraft, what he can observe to supplement the information recorded by electronic sensors. The astronaut-pilot will be able to sense and report his own reactions to conditions in space while ground observers follow these reactions by radio and television.

Two suborbital Mercury flights were accomplished by Astronauts Alan Shepard and Virgil Grissom several months ago. We expect to carry out the first orbital mission late this year or early next year.

A later phase of the manned space flight program which we call Apollo, will lead to the three-astronaut expedition to the moon. Apollo will require advanced space techniques. Results of the pioneer Mercury experiments will be incorporated in coming generations of spacecraft.

Apollo spacecraft will be mounted on top of Saturn vehicles for earth-orbit and moon-orbit missions. Even more powerful rocket vehicles may be employed for the landing on the moon. Therefore, the Apollo craft must be built to withstand much greater launch thrusts, vibration, and stress than was the case with the Mercury spacecraft. It must be capable of accurate guidance over the 240,000-mile course to the moon. It must be able to land gently on the lunar surface, and then be launched from the moon and guided back for safe return into the earth's atmosphere at the speed of 25,000 miles per hour -- almost five times the peak speed of Alan Shepard's flight last May.

According to our scientists, this atmospheric entry speed will subject the Apollo spacecraft to extreme heat peaks of about 5,000 to 6,000 degrees Fahrenheit -- or twice that of the hottest blast furnace. Not only must the structure withstand the heat developed by friction with the atmosphere and absorption from the sun's rays, but insulation and protective cooling must be perfected to maintain bearable temperature for the astronauts inside.

Like other achievements in space, the Apollo flights will be a step-by-step process. The spacecraft will first be flown in orbit around the earth so that the many components and systems of the vehicle can be tested and evaluated. Earth-orbiting flights will also be used for training the space crew and for development of operational techniques. Each will also include important scientific experiments.

As the competence of the Apollo vehicle and the men who will operate it increases, the flights will go farther and farther from earth, and will be of longer duration and greater complexity. A major step will be a manned flight around the moon, on which the crew will perform many of the guidance and control tasks that will be needed later on in the lunar landing mission.

As earlier noted, the launch vehicle for Apollo's earth orbit and circumlunar flights will be Saturn. The cluster of eight engines in the first stage will provide one and one-half million pounds of thrust for more than two minutes compared with the 360,000 pounds of thrust provided by the Atlas booster for Mercury flights.

A giant clustered booster called Nova -- which will develop 12 million or more pounds of thrust -- may be required for the lunar landing itself. Another possible approach involves the use of an advanced version of the Saturn, with the Apollo spacecraft constructed in space after it is launched into orbit where the segments will be joined together. We are studying the technology that both possibilities will require.

The past months have been a time of many decisions in the U.S. space program. Even before Congressional action on funds was completed, NASA began making a series of major decisions. We had to make them promptly. We analyzed the job -- including more than 2,000 separate problems -- with the help of modern computing machines and advanced programming techniques as used in the Polaris missile program, and employed by the du Pont Company and other firms.

We learned immediately that one of the pacing items is the construction of facilities. And there is one thing you must do before building facilities. You must decide where to build them.

Three months after The President's May 25th message, on August 24, we announced that the Cape Canaveral rocket launching reservation would be enlarged to more than five times its existing size to meet requirements of the very large boosters for the manned lunar program. This decision resulted from the work of a joint NASA-Air Force survey team which had been established to analyze launch requirements and establish the basis for selecting the launching site.

The total cost of expanding Cape Canaveral is estimated at $885 million, of which $700 million is for mission facilities, $125 million for launch support facilities, and $60 million for purchase of 80,000 additional acres.

The added real estate will help provide a buffer zone of seven to 10 miles to protect populated areas from the noise and blast of testing and launching.

The expansion at Cape Canaveral will provide room for the construction of six or more Saturn or Nova-class launch complexes.

Two weeks later, on September 7, we announced the selection of the Government-owned Michoud Ordnance Plant, near New Orleans, as a fabrication site for large launch vehicle stages. The plant will be used for production of the first stage of the Saturn booster. Michoud, which had been in standby status for several years, will be operated by an industrial contractor under the technical direction of NASA's Marshall Space Flight Center. The plant will also be used to fabricate first stages of boosters larger than the initial version of Saturn. Plans call for the plant to be in operation by early fall of 1962.

Michoud occupies 864 acres of land on the eastern outskirts of New Orleans, adjacent to Michoud Canal, which is large enough for ocean-going barges. The canal connects with the Gulf Intracoastal Waterway, and with the Mississippi River Gulf Outlet Canal, now under construction. Also, we have selected 13,500 acres in southwest Mississippi near the Michoud plant, to be used to ground-test large rockets. In addition, NASA is acquiring rights to about 128,000 surrounding acres in Mississippi and Louisiana as a noise and blast buffer zone.

On September 19, we announced the choice of a thousand acres in Harris County, Texas, at the edge of Houston, as the site of NASA's new Manned Spacecraft Center, for which \$60 million has been appropriated this year. This facility will be the command center for the manned lunar landing expedition and for succeeding manned space flight missions. Construction will start soon and the laboratory will be operational in 1964. The staff is being assembled immediately and will be housed in temporary quarters in Houston.

The selection of Houston completes a complex of four locations at warm-water ports around the Gulf of Mexico, connected by deep-water transportation and supplementing the major facilities we have at Huntsville, Alabama -- the Marshall Space Flight Center, managed by Dr. Wernher von Braun. In this complex, it will be possible to work most of the year outdoors and to transport by water the large spacecraft units involved in the Apollo project. It will be possible, in fact, to develop such larger spacecraft as multi-manned, earth-orbiting space stations. These larger craft can be transported directly from Houston to Cape Canaveral or to the Michoud works by water.

The NASA Manned Spacecraft Center personnel will move, group by group, to Houston from Langley Research Center in Virginia.

Late in September, we completed a reorganization of NASA to provide better focus and greater emphasis on major programs and to provide increased voice in policy-making and program decisions for directors of the research and development centers. The changes -- which went into effect on November 1 -- also enable NASA general management to exercise greater control over programs.

The directors of the nine NASA field centers now report directly to general management instead of to one of the headquarters program offices. Four new headquarters program offices were created which will have the responsibility for carrying out their programs in the most expeditious way, drawing on industrial, university, or governmental resources as needed. They will establish technical guidelines, budget and program funds, schedule each project, and evaluate progress.

The U.S. space program, as now organized, is truly a national effort. The objective of manned lunar exploration within the shortest time possible requires the planning and fitting together of a large number of actions, a systematic organization of the effort, and a constant evaluation of progress. The results, and the effectiveness of the men and means employed, must be constantly reviewed by a leadership capable of hard-boiled adjustment to overcome deficiencies and to exploit opportunities as they arise.

Some of our nation's best qualified men, who have made important contributions to our national aerospace position in our universities and industry, have accepted leading roles in our space program. These men bring the highest personal, technical, and professional qualifications to our effort. There is the old saying in American industry that if you want to make soap, you have to get a man who knows how to make soap. These men, and many others associated with them, know the technical side of aeronautics and space and are all experienced in the management of large activities. Each has demonstrated a personal earning capacity far beyond what the Government is able to pay for their services. Each is thoroughly familiar with the opportunities and problems associated with our most advanced and important technical development efforts.

It is fortunate for this nation that men with these high qualifications and such experience are willing to forego large earnings in industry and normal personal and family life to supply the leadership needed in our national space effort.

There is not time this afternoon to talk about the 55 successful earth satellites the United States has launched, the two sun satellites -- with one of which, Pioneer V, we kept contact for a record 22,500,000 miles -- and our two deep space probes. However, I would like to sketch briefly a few points illustrating how the space technology we are developing has already begun to be of value to our country and to other nations.

For example, the TIROS III weather satellite, launched last July 12, located and televised pictures of seven of the eight hurricanes that struck our Atlantic Coast this season. This satellite found Hurricane Esther two days before conventional weather aircraft spotted the storm.

In the far Pacific, one storm observed by aircraft seemed to be dying out and the weather services of the nations concerned called in their planes on September 22. Two days later, however, TIROS pictures warned that the storm had been regenerated and it became Typhoon Sally.

TIROS information has been a boon to the West Coast fishing industry by supplying warnings of a number of storms off the California coast. Further, information from infrared sensors on the TIROS satellites have initiated a whole new effort to measure, both day and night, the balance between the heat absorbed by the earth and radiated by it, and the effects of changes in this heat balance on weather.

Most of you have seen the 100-feet balloon communications satellite Echo, one of the brightest objects in the sky, launched more than a year ago. It is still aloft and still useful as a radio reflector.

Communications satellites will make possible cheaper and more reliable transoceanic telephone and telegraph service and instantaneous transmission of great quantities of information between the continents, and ultimately world-wide television. For example, through use of these satellites, the day may come when you could have the closing prices from every major market and exchange in the world available here in Chicago within minutes, or feed data on problems requiring computer processing in a country in Africa into a computer center here in Chicago.

NASA is developing several different communication satellite techniques. Among these is the bigger Echo balloon, 140 feet in diameter, with a more rigid structure to enable it more nearly to retain its shape as it moves through space. There are two other NASA programs for the development of communication satellites that will act as relay stations in orbit, rather than as simple reflecting mirrors. In addition, the American Telephone & Telegraph Co. is supporting a project to test its own ideas of how relay satellites should be built. One of these methods will be chosen for an operational communications system. It has been speculated that the satellite system may have progressed enough by 1964 that we shall be able to watch the Tokyo Olympic Games on television at home.

Other practical benefits of space technology are coming along. The goal of landing men on the moon and returning them within this decade will greatly expand our nation's capacity in science, engineering, and technology.

It has been our history as a nation that, whenever we have engaged in a major technological enterprise, the feed-back into the private sector of the economy has been enormous. The World War II atom bomb project spurred vast development of nuclear energy and radio-isotopes in America. Military advances in aeronautics have helped our aviation industry gain and hold its position of world leadership. Postwar aerospace developments have brought about large-scale expansion and progress in the electronics industry.

It should be no surprise that we have already begun to reap benefits from space programs of recent years. For example, American industry has developed a valuable technology of utilizing very low temperatures to satisfy requirements established first for atomic energy and then on a larger scale for rockets.

Liquid oxygen -- now that we have learned to produce it in huge volume as a rocket propellant -- is finding wide use in the steel industry to make open hearth furnaces burn hotter and cleaner, and thus to make high-grade steel cheaper. Liquid nitrogen, a by-product of liquid oxygen manufacturing, is used to freeze whole blood for storage and to produce fresher-tasting orange juice than could be accomplished by previous freezing processes.

There is a host of other applications. The most interesting are yet to come. They await the juncture of the idea, the need, and the man or company with funds and imagination to bring them out. We are just at the beginning of an age of profound scientific and technological change whose end none of us can foresee.

Our new manned and unmanned space science, exploration, and application programs constitute the largest peacetime research and development endeavor in the history of our country. The technology developed and fed back into our economy will be correspondingly large.

No single organization can carry out so ambitious a program. No agency has a monopoly on the skills, the missions, or the requirements. The space program is and must continue to be national in scope. In carrying out its portion of the responsibility, NASA will continue to cooperate with private industry, universities, non-profit laboratories, and other government agencies -- the Department of Defense, the Atomic Energy Commission, the Weather Bureau, the Federal Communications Commission, the Federal Aviation Agency, the National Science Foundation, the National Academy of Sciences and others.

For example, we are working jointly with the Atomic Energy Commission on the Rover nuclear rocket and on programs to develop electric power sources for use in space. We are pulling in harness with the Weather Bureau of the Department of Commerce to develop an operational system for launching weather satellites. In similar fashion, we are working closely with other agencies.

In total, the objectives of our national space effort were well stated by Senator Robert S. Kerr, Chairman of the Senate Committee on Aeronautical and Space Sciences, when he said, "I am convinced that the nation which leads in exploring and using space for peaceful purposes can best build, improve, and inherit the earth."

I myself believe he is profoundly right.

# # #

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Sunday AM's
November 12, 1961

RELEASE NO. 61-248

MERCURY-ATLAS 5

The near-perfect performance of Mercury-Atlas 4 on September 13, 1961, provided an important first-orbital qualification test of the Mercury-Atlas systems, including launch, automatic operation in orbit, re-entry, tracking network and recovery.

The upcoming mission -- Mercury-Atlas 5 which is to be launched no earlier than November 14 -- will place even greater demands on the spacecraft. This time the craft will be programmed to operate up to three times as long as the one-orbit MA-4 flight.

Also, in MA-5 a live passenger -- a chimpanzee -- will replace the "crewman simulator" flown in MA-4.

Thus the flight poses a critical test of all systems, particularly the spacecraft's Environmental Control System which must provide a livable gaseous environment for later manned flights.

THE FLIGHT PLAN

MA-5 will be launched into a 32-degree orbital path along the Mercury worldwide network. A full three orbits would require about four and a half hours at altitudes ranging from approximately 100 to 150 statute miles.

Although the mission calls for a maximum of three orbits, the capsule could be commanded down at the end of the first or second orbit without compromising many of the flight objectives. In any case, as the craft approaches the West Coast of North America, the retrorockets will be fired to start re-entry.

One orbit would put the craft down slightly east of Bermuda. Termination after two orbits would mean touchdown several hundred miles south of Bermuda. After three orbits, the spacecraft would begin to enter the atmosphere over Southern Florida and hit maximum 8G deceleration and 2,000-degree F. re-entry heating at an altitude of about 37 miles. Touchdown would occur some 1,000 miles southeast of Cape Canaveral.

As in earlier Mercury flights, the spacecraft will escape automatically should a malfunction occur during the boost phase of the flight. With the jettisonable escape tower in place atop the two-ton craft, the Mercury-Atlas configuration stands 93 feet tall. The capsule itself measures nine and a half feet tall and six feet across the base.

THE SPACECRAFT

The MA-5 spacecraft will have a 7 by 11 by 19-inch "picture window" instead of two small portholes used in earlier capsules. Craft with the large window have been flown three times: twice in the Little Joe series of escape system tests and, more recently, in the second manned suborbital flight, Mercury-Redstone 4.

Environmental System -- A fully operational Environmental Control System (ECS) has been included in MA-5. The primate will be in a pressure-tight metal-and-plastic box which is connected to the ECS suit circuit in the same manner that an astronaut's suit would be. The animal will be restrained to a form-fitted plastic pallet by a net harness.

Minor modifications have been incorporated in the environmental system to preclude the possibility of excessive oxygen consumption as occurred during MA-4. Postflight investigation of MA-4 revealed that launch vibrations caused the manual handle controlling the emergency oxygen system to move slightly, thereby allowing higher oxygen flow into the crewman simulator than was necessary. Had an astronaut been aboard MA-4, the problem would have easily been recognized and corrected.

MA-5 will be the first Mercury flight to excercise the Environmental Control System with sufficient oxygen to support a three-orbit mission.

Control System - The MA-5 spacecraft's atitude will be controlled by the Automatic Stabilization and Control System (ASCS).

Quick-Release Hatch - The MA-5 spacecraft is equipped with a quick-release escape hatch, identical in design to that used in the manned suborbital flight of Astronaut Virgil I. Grissom. It is removed by the ignition of a pyrotechnic train in the door frame which breaks the bolts securing the hatch.

Following the premature release of the MR-4 spacecraft hatch during recovery operations, an identical hatch was subjected successfully to an extensive series of tests in a variety of environmental conditions. The MA-5 flight provides an additional test.

Communications - The Communications Systems will be operational in MA-5. To exercise and evaluate the voice communication system, prerecorded voice messages and periods of silence are provided on each of two playback tape recorders. The duty cycles allow for a short transmission from one tape and then a period of silence, at which time the other recorder and the applicable ground station will transmit.

Voice messages have been recorded by several of the astronauts to assess transmission clarity and procedures. A typical transmission sounds like this:

"Capcom, this is Astro. Am on the window and the view is great. I can see all the colors and can make out coast lines. Environment is okay. I feel great. Elapsed time is 02:48:30 - Mark. Over." Another typical transmission might include a readout of instruments and reporting of control actions: "Fuel auto 90 - manual 100, RSCS on, manual handle out, pitch handle out. Pitch up at 4 degrees/sec to minus 15."

On Board Cameras - Four separate camera systems will be carried in MA-5. A 16mm primate observer camera situated on the main instrument panel will photograph the animal throughout the mission until near the time of landing. The camera is to the left of the periscope. A second 16mm camera, near the couch, will film the spacecraft instrument panel, providing coverage throughout the mission and for about 3 minutes after landing. A third 16mm camera will film the view seen through the periscope. The camera will operate for nearly 3 hours following orbit insertion.

A 70mm earth-sky camera will provide coverage throughout the mission of the view from the spacecraft window. (High speed color film will be used in all on-board cameras.)

Radiation Measurement - Four standard radiation packs will be placed in the spacecraft, one on either side of the position normally occupied by the astronaut's head and feet. Two additional packs, which contain the same type, but thicker, emulsion than the standard packs, will measure the incident radiation spectrum. As compared to investigating only total dosage, as indicated by standard packs, these will be used to determine the number and type of radiation to which the spacecraft has been exposed. It will also attempt to determine the initial energy of the particles by measuring the depth of penetration. One pack is mounted on the hatch while the other will be placed on the earth/sky camera bracket.

Heat, Noise and Vibration Measurement - Some 78 heat-measuring instruments have been located in temperature sensitive areas of the spacecraft. No effort will be made to sample noise and vibration during MA-5 since data acquired in the previous orbital Mercury flight revealed that neither was of sufficient magnitude to warrant further investigation.

Spacecraft Instrumentation - The occurrence of each major flight event will be telemetered to ground stations and simultaneously picked up by on-board recording equipment. Other measurable quantities, such as acceleration, pressures, temperatures and spacecraft attitude, will be similarly telemetered and recorded.

ANIMAL SELECTION

Early in the Mercury program it was decided that prior to manned orbital flight, the Mercury spacecraft should be tested with an animal subject to demonstrate the adequacy of the various life support systems. In addition, it was agreed that the animals selected for this program should be capable of learning simple psychomotor tasks which could be performed during flight, thus permitting evaluation of stresses imposed by acceleration and deceleration as well as the effects of prolonged weightlessness.

Animal Flight Activities - The MA-5 flight animal will be harnessed in a pressure-tight container with a windowed dome. A livable gaseous atmosphere of 100 per cent oxygen maintained at room temperature and a pressure equivalent to 27,000 ft. altitude, will be provided by the spacecraft's Environmental Control System, located beneath the couch. The encapsulated chimp will be in the equivalent of the pressure suit of an astronaut.

One of five chimpanzees -- among them, "Ham" which made a 155-mile-high flight in MR-2 on January 31, 1961 -- will be selected for the flight. In the past six months, these chimps, with an average weight of about 40 pounds and average age of four years, have learned a 70-minute program involving four separate tasks. The program which automatically recycles includes rest periods, rewards of an occasional sip of water or a banana-flavored pellet and, if the response is not up to par, a mild shock in the left foot. Records show the need for the latter, what psychologists call "negative re-inforcement, is "very infrequent."

The animal works at a waist-high shelf equipped with three levers beneath three display panels. In most of the tests, he is to react to a colored light by hitting the appropriate lever under the light. In another test, he will study three symbols, two of which are alike. He must indicate which symbol is different.

Signals emanating from the spacecraft during flight will provide medical monitors at tracking stations with a running report on the animal's heart rate, blood pressure, respiration and body temperature.

Animal Training - The Bioastronautics Research Laboratory of Holloman Air Force Base, has directed the animal training program in support of Project Mercury.

Maj. Dan Mosely, USAF, is Bioastronautics Project Officer for the flight.

THE NETWORK

During the flight, information from tracking and ground instrumentation points around the globe will pour into NASA's Goddard Space Flight Center at Beltsville, Md., at the rate, in some cases of more than 1,000 bits per second. Upon almost instantaneous analysis, the information will be relayed to the Mercury Control Center at the Cape for action.

The Mercury network demands more than other tracking systems. Mercury missions are accomplished in the short span of a few hours. This requires instantaneous communication. Tracking and telemetered data must be collected, processed and acted upon as near "real" time as possible. The position of the vehicle must be known continuously from the moment of lift-off.

Data on the numerous capsule systems are sent back to Earth and presented in near actual time to observers at various stations. And during the recovery phase, capsule impact location predictions will have to be continuously revised and relayed to recovery forces.

An industrial team headed by Western Electric Company recently turned over this global network to the National Aeronautics and Space Administration.

The other team members are Bell Telephone Laboratories, Inc.; The Bendix Corporation; Burns and Roe, Inc.; and International Business Machines Corporation. At the same time, the Lincoln Laboratory of Massachusetts Institute of Technology also has advised and assisted NASA on special technical problems relating to network.

The network consists of 18 stations. Mercury Control Center at Cape Canaveral connects to the other 17 stations through a data processing and switching center at Goddard.

All 18 stations are fully operational. Across the Atlantic are: Cape Canaveral, Grand Bahama Island, Grand Turk Island, Bermuda, Grand Canary Island, and a specially fitted ship in mid-Atlantic.

The network includes African sites at Kano, Nigeria, and Zanzibar, a ship in the Indian Ocian, Australian stations at Muchea and Woomera, Canton Island in mid-Pacific and Kauai Island, Hawaii. The system also takes in stations at Point Arguello, California; Guaymas, Mexico; White Sands, New Mexico; Corpus Christi, Texas; and Eglin, Florida.

Some 20 private and public communication agencies throughout the world provide leased land lines and overseas radio and cable facilities.

MERCURY LAUNCH CHRONOLOGY

Two types of Mercury spacecraft have been used in the flight test program. First series of shots used full-scale "boilerplate" models of the capsule to check out booster-spacecraft integration and the escape system. Second phase of the development firing program used Mercury capsules built to production standards.

This is the chronology of test firings:

September 9, 1959: Big Joe. NASA-produced research and development capsule, launched on an Atlas from Cape Canaveral -- test validation of the Mercury concept. Capsule, survived high heat and airload and was successfully recovered.

October 4, 1959: Little Joe 1. Fired at NASA's Wallops Station, Virginia, to check matching of booster and spacecraft. Eight solid-propellant rockets producing 250,000 lbs. of thrust drove the vehicle.

November 4, 1959: Little Joe 2. Also fired from Wallops Station, was an evaluation of the low-altitude abort conditions.

December 4, 1959: Little Joe 3. Fired at Wallops Station to check high-altitude performance of the escape system. Rhesus monkey Sam was used as test subject.

January 21, 1960: Little Joe 4. Fired at Wallops Station to evaluate the escape system under high airloads, using Rhesus monkey Miss Sam as a test subject.

May 9, 1960: Beach Abort Test. McDonnell's first production capsule and its escape rocket system were fired in an off-the-pad abort escape rocket system (capsule 1).

July 29, 1960: Mercury-Atlas 1. This was the first Atlas-boosted flight, and was aimed at qualifying the capsule under maximum airloads and afterbody heating rate during reentry conditions. The capsule contained no escape systems and no test subject. Shot was unsuccessful because of booster system malfunction (Capsule 4).

November 8, 1960: Little Joe 5. This was another in the Little Joe series from Wallops Station. Purpose of the shot was to check the production capsule in an abort simulating the most severe Little Joe booster and the shot was unsuccessful (Capsule 3).

November 21, 1960: Mercury-Redstone 1. This was the first unmanned Redstone-boosted flight, but premature engine cutoff activated the emergency escape system when the booster was only about one inch off the pad. The booster settled back on the pad and was damaged slightly. The capsule was recovered for re-use (Capsule 2).

December 19, 1960: Mercury-Redstone 1A. This shot was a repeat of the November 21 attempt and was completely successful. Capsule reached a peak altitude of 135 statue miles, covered a horizontal distance of 236 statute miles and was recovered successfully (Capsule 2).

January 31, 1961: Mercury-Redstone 2. This was the Mercury-Redstone shot which carried Ham, the 137-lb. chimpanzee. The capsule reached 155 statute miles altitude, landed 420 statute miles downrange, and was recovered. During the landing phase, the parachuting capsule was drifting as it struck the water. Impact of the angle blow slammed the suspended heat shield against a bundle of potted wires, which drove a bolt through the pressure bulkhead, causing the capsule to leak. Ham was rescued before the capsule had taken on too much water (Capsule 5).

February 21, 1961: Mercury-Atlas 2. This Atlas-boosted capsule shot was to check maximum heating and its effect during the worst re-entry design conditions. Peak altitude was 108 statute miles; re-entry angle was higher than planned and the heating was correspondingly worse than anticipated. It landed 1425 statute miles downrange. Maximum speed was about 13,000 mph. Shot was successful (Capsule 6).

March 18, 1961: Little Joe 5A. This was a repeat of the unsuccessful Little Joe 5; it was fired at Wallops Station and was only marginally successful (Capsule 14).

April 25, 1961: Mercury-Atlas 3. This was an Atlas-boosted shot attempting to orbit the capsule with a "mechanical astronaut" aboard. But 40 sec. after launching, the booster was destroyed by radio command given by the range safety officer. The capsule was recovered and will be fired again (Capsule 8).

April 28, 1961: Little Joe 5B. This was the third attempt to check the escape system under worst conditions, using a Little Joe booster fired from Wallops Station. Capsule reached 40,000 ft., and this time the shot was a complete success (Capsule 14).

May 5, 1961: Mercury-Redstone 3. This Redstone-boosted shot carried Astronaut Alan B. Shepard, Jr. on a ballistic flight path reaching a peak altitude of 115 statute mi. and a downrange distance of 302 statute mi. Flight was successful (Capsule 7).

July 21, 1961: Mercury-Redstone 4. This successful flight carried Astronaut Virgil I. "Gus" Grissom to an altitude of 118 statute miles and 303 miles downrange. The capsule sank despite helicopter recovery efforts. (Capsule 11).

September 13, 1961: Mercury-Atlas 4. This successful flight saw the spacecraft attain orbit for the first time. The craft carried a "crewman simulator" designed to use oxygen and put moisture into the cabin at about the same rate as a man. Craft was recovered as planned about 160 miles east of Bermuda after one orbit. (Capsule 8).

MERCURY RECOVERY FORCE

For MA-5, recovery support is required from Cape Canaveral across the Atlantic to the Canary Islands. The organization responsible for this support is known as the Project Mercury Recovery Force and is under the command of Rear Admiral John L. CHEW, USN, Commander Destroyer Flotilla FOUR.

Mercury Test MA-5 will be the 19th recovery operation in which this force has participated. For each Mercury launch, composition of the recovery force is specially tailored to meet NASA's requirements. These forces vary with each recovery, but are normally composed of ships, aircraft and Marine helicopters from the U.S. Atlantic Fleet, aircraft from the AFMTC, aircraft and pararescue Teams of the Air Rescue Service and amphibious LARC's from the Army. Admiral CHEW exercises overall control of the recovery force from the Recovery Room located next to the control room in the Mercury Control Center at Cape Canaveral.

If the unexpected happens and an abort occurs on the pad, the first Recovery Unit to be called upon will be a veteran recovery group, stationed right at the launch site. This group, under the Command of Lt. Col. Harry E. CANNON, USAF, of the Air Force Missile Test Center, consists of four Marine Air Group Twenty Six Helicopters, three Army LARC's (light amphibious vehicles) and small boats. The personnel makeup of this versatile team includes pilots, firefighters, medical personnel and spacecraft technicians who, by many practice pick-ups, have developed the "know-how" for quick retrieval despite the natural problems presented by shallow water, ditches and dense underbrush.

The area offshore to Bermuda had been assigned to a recovery group under the command of Captain J. D. H. KANE Jr., USN, Commander Destroyer Division 282, embarked in the USS EATON. Units of this group are:

USS EATON (DDE-510) commanded by Cdr. P. R. PERKINS, USN
USS BEALE (DDE-471) commanded by Cdr. R. J. LOOMIS, USN
USS OPPORTUNE (ARS-41) commanded by Lcdr. T.F. BYRNES Jr.,USN
USS AVENGE (MSO-423) commanded by Lcdr R. W. HALL, USN
4 P2V aircraft from Patrol Squadron EIGHTEEN commanded by Cdr. W. W. HONOUR, USN.

From BERMUDA to approximately half way across the Atlantic a group under the command of Captain N. E. THOMAS, Commander Destroyer Squadron TWELVE embarked in the USS DAVIS, will consist of:

USS DAVIS (DD-937) Commanded by Cdr A. P. SLAFF, USN
USS FORT MANDAN (LSD-21) Commanded by Cdr. N.C. WOODWARD, USN
(with 3 Marine Air Group TWENTY-SIX HUS helicopters embarked)

USS BACHE (DDE-470) Commanded by Cdr. W. S. SHEID, USN
USS MURRAY (DDE-576) Commanded by Cdr. G. A. KELLEY, Jr., USN
USS HAWKINS (DDR-873) Commanded by Cdr. S. LORENZ, Jr., USN
USS BIGELOW (DD-942) Commanded by Cdr. J. A. DUDLEY, USN
2 WV aircraft from Airborne Early Warning Squadron FOUR Commanded by Cdr. W. S. WEBSTER Jr., USN 6 P5M aircraft from Patrol
Squadrons 45 and 49 commanded by Cdr. A. S. LEE, USN, and Cdr. P. E. HILL, USN respectively. 4 P2V aircraft from Patrol Squadron EIGHTEEN, 4 SC-54 aircraft from 55th Air Rescue Squadron commanded by LCOL RUDRUD, USAF.

The area assigned this group includes the site selected for the spacecraft landing if it was decided to terminate the flight after one orbit.

From BERMUDA to AFRICA a group under the command of Captain L. W. MATHER, USN consists of:

USS CHIKASKIA (AO-54) Commanded by Captain L. W. MATHER, USN
USS COMPTON (DD-705) Commanded by Cdr. L. K. WORTHING, USN
USS CONE (DD-866) Commanded by Cdr. C. A. TAYLOR
USS VOGELGESANG (DD-862) Commanded by Cdr. C. H. HAYDEN, USN
4 WV aircraft from Airborne Early Warning Training Unit Atlantic, Commanded by Cdr.L.J. PAPAS, USN
8 P2V aircraft from Patrol Squadron FORTY-FOUR Commanded by Cdr. R. L. PIERCE, USN

South of Bermuda at a site selected for landing at the end of the second orbit a small group commanded by Capt. J. B. SCHLEY, USN Commander Destroyer Division 82 embarked in the USS FISKE consists of:

USS FISKE (DDR-842) Commanded by Cdr. C. E. HUNTER, USN
3 P5M aircraft from BERMUDA PATROL UNIT Commanded by Cdr. P. E. HILL, USN

In the primary landing area, at the end of the third orbit, will be a Task Group under the Command of RADM J. R. REEDY, USN, Commander Carrier Division TWENTY, who will fly his flag in the USS LAKE CHAMPLAIN. This group consists of:

USS LAKE CHAMPLAIN (CVS-39) Commanded by Capt. C. A. BOLAM,USN
USS D. H. FOX (DD-779) Commanded by J. J. DOAK, Jr., USN with Capt. I. C. KIDD, Jr., USN, COMDESDIV 322, embarked.
USS J. C. OWENS (DD-776) Commanded by Cdr. R. L. DISE, USN
6 P2V aircraft and Patrol Squadron SIXTEEN Commanded by Cdr. R. G. BAGBY, USN
2 SA-16 and 2 SC 54 aircraft of the Air Rescue Service from units under the Command of Brig. Gen. J. A. CUNNINGHAM, USAF
3 HUS helicopters from Marine Air Group TWENTY-SIX Commanded by COL P. T. JOHNSTON, USMC.

The planned method of retrieval will be by surface ship or helicopter. Eleven of the deployed ships have conducted pick-ups with dummy spacecraft. Aircraft have trained in the special location techniques used for Mercury missions. Training in other aspects of the mission has been conducted to keep the force in a high state of readiness.

MERCURY PERSONNEL ASSIGNMENTS

More than 70 key flight controllers and medical monitors will be in position at Mercury tracking stations during the Mercury-Atlas 5 flight.

The flight will be used to demonstrate and further evaluate the capability of the network to perform flight control and data collection functions.

Astronaut Malcolm S. Carpenter will be in the blockhouse at Pad 14 at Cape Canaveral.

In the Mercury Control Center at the Cape will be Walter C. Williams, NASA Manned Spacecraft Center Associate Director,; Christopher C. Kraft, Jr., Flight Director; Rear Admiral John L. Chew, USN, Commander, Destroyer Flotilla Four, Recovery force commander; Colonel Philip Maloney, USAF, representing Major General Leighton I. Davis, Commander, Atlantic Missile Range; Captain Henry F. Clements, USAF, Network Status Monitor and H. C. O'Dell, Missile Telemetry Monitor for General Dynamics, and Tecwyn Roberts, Carl R. Huss and Howard C. Kyle, all of Flight Operations Division; Mort Schler and Dr. Stanley C. White of Life Systems Division; Walter J. Kapryan, of the Engineering Division; H. Ellingson, Medical Monitor; Warren North of NASA Headquarters. Astronaut V. I. "Gus" Grissom will be capsule communicator with Astronaut John H. Glenn, Jr., backing him up.

NASA Manned Spacecraft Center Recovery personnel in MCC will be Robert F. Thompson as Recovery Coordinator and Charles I. Tyman, Jr., as Assistant Recovery Coordinator.

On duty at the Bermuda tracking station will be Astronaut Alan B. Shepard, John D. Hodge and Glynn Lunney of Flight Operations Division; Frank H. Samonski of Life Systems; James Tomberlin and James Strickland of Philco; and Drs. Patrick Laughlin of Life Systems and Charles A. Berry, as Medical Monitors.

On the Atlantic Ocean Ship will be Raymond G. Zedekar, Office of the MSC Director; Wilbur Huber of Philco; and Drs. Glenn F. Kelly and Willard R. Hawkins as Medical Monitors.

David A. Beckman of Flight Operations and John A. Longan of Philco will be on duty at the Zanzibar Station, along with Medical Monitors Drs. Samuel Fox and Francis Flood.

John S. Llewellyn of Flight Systems and Marvin Rosenbluth of Philco will join Medical Monitors C. H. Kratochvil and V. Marchbanks at the station at Kano, Nigeria.

On duty at the Indian Ocean Ship will be Rodney E. Higgins of Flight Operations and Lloyd White of Philco, along with Medical Monitors W. H. Hall and Richard Hansen.

John H. Langford of Structural Analysis and Harold B. Stenfors of Philco will join Medical Monitors Julian E. Ward and Robert Burwell at the station at Canary Islands.

Operating at the station at Muchea, Australia, will be Astronaut Walter M. Schirra, Jr.; Richard A. Hoover of Flight Operations; Albert J. Barker of Philco; with E. L. Beckman and W. Bishop serving as Medical Monitors.

Frank A. Volpe of Flight Systems, William A. Wafford of Philco and Medical Monitors E. L. Overholt and J. Lane will be at the Woomera, Australia, station. At the Canton Island station will be Charles C. Olasky, Jr. of Flight Operations and Lewis DeLuca of Philco, along with Medical Monitors F. M. G. Holmstrom and D. Graveline.

The Hawaiian station, Robert E. Ernull of Flight Operations and Ted White of Philco, as well as Medical Monitors F. H. Austin and R. Moser.

Point Arguello, California, Astronaut Leroy G. Cooper, Jr.; Arnold D. Aldrich of Flight Operations; Richard J. Rembert of Philco; and Medical Monitors H. Bratt, C. Pruett and G. Benson.

Guaymas, Mexico, Astronaut Donald K. Slayton; Thomas E. Moore of Flight Systems; Daniel Hunter of Philco; along with Medical Monitors T. R. Davis and W. Turner.

Helmut Keuhnel of Flight Operations and Cyrus Bumbaugh of Philco, along with Medical Monitors G. B. Smith, Jr,. J. Lawson and R. Kelly will be at the Corpus Christi, Texas, station.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: IMMEDIATE
November 11, 1961

RELEASE NO. 61-250

X-15 REACHES DESIGN MAXIMUM SPEED

A maximum speed flight in the X-15 research airplane has been completed by Major Robert M. White, USAF, one of the prime research pilots in the X-15 program. At first announced as 4070 miles an hour, based on preliminary radar data, White's speed was corrected to 4093 mph, following examination of instruments in the aircraft.

Maj. White made the unofficial record on Thursday, November 9, following launch from a B-52 carrier at 45,000 feet over Mud Lake, Nevada. This was his eleventh powered flight in the X-15. He landed on Rogers Dry Lake, at Edwards, California, about 200 miles away.

He attained a speed of Mach 6.04 at 95,800 feet. Highest altitude attained was 101,600 feet, and highest temperature, due to aerodynamic heating, 1147 degrees (F) on the wing leading edge. The rocket engine burned at maximum throttle for 86 seconds. Total flight time was 10 minutes. The aircraft speed brakes (flaps) were not used during the speed run.

Engineers of the NASA's Flight Research Center at Edwards programmed the flight based on numerous practice runs in the X-15 simulator and on experience with a long series of flights at lower speeds. Primary objectives were to obtain maximum speed and evaluate handling qualities of the airplane with its stability augmentation system inoperative. Some cracking occurred in the right outer panel of the windshield during descent, the cause of which is being studied by engineers and scientists.

The X-15, a joint USAF-Navy-NASA program, is being flown to obtain scientific information on many factors including aerodynamic heating, stability and control, and structures and operating problems, in the supersonic and hypersonic speed ranges. The design altitude objective--about 50 miles--is under consideration for an early attempt. The research program will be continued for many months with three X-15 aircraft and a staff of research pilots.

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
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FOR RELEASE: AM's Sunday
November 19, 1961

RELEASE NO. 61-251

FLIGHT RATING TEST COMPLETED ON ROCKET ENGINE

The nation's first liquid hydrogen rocket engine has successfully completed its preliminary flight rating test, the National Aeronautics and Space Administration announced today.

The engine, the RL-10, was designed and developed for NASA's Marshall Space Flight Center by Pratt and Whitney Division of United Aircraft Corportation at its West Palm Beach, Florida plant.

This test marks a significant milestone in the development of the engine whose performance is about 30 percent better than current rocket engines using conventional hydrocarbon fuels such as kerosene. This makes possible greater payloads or longer range for U.S. launch vehicles.

Two RL-10's will power the Centaur space vehicle, scheduled for its first flight test in the next few months. Later six RL-10's will be clustered to power the second (S-IV) stage of the Saturn vehicle.

The test consisting of 20 captive firings, was completed in five days. All firings were accomplished with the engine under simulated space conditions. Throughout the test the engine consistently produced its rated 15,000 pounds of thrust.

Inspection following the firings indicated the engine was still in condition for continued firing and further testing.

Development of the RL-10 -- previously known as the XLR-115 -- was started in October, 1958. During the development program, the RL-10 completed over 700 firings for an accumulated firing time in excess of 60,000 seconds. The program recently accelerated to about 70 firings a month.

Pratt and Whitney has delivered a total of 12 engines to the High Thrust Test Area, Edwards, Calif., to the NASA Lewis Research Center, Cleveland, Ohio, and to General Dynamics/Astronautics and

(Over)

Douglas Aircraft Company for further testing prior to launching of the Centaur and Saturn space vehicles from Cape Canaveral.

Fueled by liquid hydrogen, whose boiling point is -423° F., the engine is designed to provide a capability of multiple restarts in space with coast periods of many hours between firings.

The engine uses a regenerative, or 'bootstrap' cycle, to pump and burn hydrogen. The fuel drives the pump system and also cools the thrust chamber. The hydrogen, sparked by an electrical igniter, burns with liquid oxygen inside the thrust chamber.

NASA ~~Inventions~~ & Contribution Award

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
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FOR RELEASE: November 16, 1961
3 PM's

RELEASE NO. 61-252

O'SULLIVAN RECEIVES INVENTION AWARD

William J. O'Sullivan, Jr., scientist at the NASA Langley Research Center, Langley Field, Virginia, received a $5,000 cash award today from NASA Administrator James E. Webb for his invention of the inflatable space vehicle. The invention has been employed in two successful NASA space experiments, Echo I and Explorer IX.

In presenting the award, Webb cited O'Sullivan for his "significant contribution to space science and technology in conceiving the inflatable space vehicle invention and in initiating and directing its successful development, in the face of many obstacles, into an extremely useful device for upper atmosphere space research and worldwide communication."

The idea was conceived by O'Sullivan in January 1956, and his proposal was accepted as an experiment for the International Geophysical Year. He demonstrated that a very thin, aluminum-coated Mylar-plastic sphere, stressed slightly beyond its elastic limit during the inflation process, would retain its shape regardless of subsequent loss of internal pressure. Thus he proved this device could serve as a useful space research vehicle.

On August 15, 1961, U. S. Patent No. 2,996,212, entitled "Self-supporting Space Vehicle", was issued to the Administrator of NASA, in behalf of the United States, for the invention.

A research scientist at the Langley Center since November 1938, O'Sullivan is head of the Space Vehicle Group and also serves as assistant to the chief of the Applied Materials and Physics Division. He is presently participating in NASA's communication satellite program using inflatable spheres, the development of solar power plants, and directing fundamental research in polymer chemistry as applied to plastics.

(Over)

O'Sullivan, who is 46, was born in Louisville, Kentucky, attended local schools there and received a bachelor of science degree in aeronautical engineering from the University of Notre Dame in 1937.

This was the second award recommended by the NASA Inventions and Contributions Board and made under the provisions of the Space Act of 1958, Sec. 306. Dr. Frank T. McClure of the Johns Hopkins University Applied Physics Laboratory, Silver Spring, Md., received $3,000 for his invention of a Satellite Doppler Navigation System on January 17, 1961. His invention became the basis of the Navy Department's Transit navigational satellite program.

-End-

Lust 8

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Friday AM's
November 24, 1961

RELEASE NO. 61-253

AUGUST CONTRACTS

The National Aeronautics and Space Administration awarded the following new contracts and research grants during August, 1961. The figures shown represent the total estimated cost of contracts of $50,000 or more let during the month.

HEADQUARTERS
Washington, D.C.

University of California (Berkeley, Calif.)--$70,000--Scientific research on dynamic behavior of porous electrode systems.

University of Arizona (Tucson, Ariz.)--$142,000--Basic research on selenodetic and physical studies of lunar surface.

University of California (Berkeley, Calif.)--$80,000--Research on hemodynamic and related physiological functions in primates.

Electronic Communications (Timonium, Md.)--$76,000--Develop techniques of superheterodyne receiver.

Arinc Research Corp. (Washington, D.C.)--$301,000--Saturn reliability study.

Commerce Dept., Bureau of Standards (Washington, D.C.)--$100,000--Develop radiometric standards for extreme ultraviolet.

Atomic Energy Commission (Germantown, Md.)--$105,000--Theoretical studies of space vehicle shielding.

Air Force Systems Command (Wright Patterson AFB, Ohio)--$50,000--Support activities, radiation effects information center.

AMES RESEARCH CENTER
Moffett Field, Calif.

S & Q Construction Co. (San Francisco, Calif.)--$349,000--Test sections, components and auxiliary piping systems.

Enviratron Co. (Van Nuys, Calif.)--$60,000--Controlled atmosphere room in hypervelocity research laboratory.

LEWIS RESEARCH CENTER
Cleveland, Ohio

Hughes Aircraft Co. (Culver City, Calif.)--$96,000--Feasibility study for low temperature thermionic energy converter.

LANGLEY RESEARCH CENTER
Langley Field, Va.

Aerojet General Corp. (Sacramento, Calif.)--$300,000--Develop Algol rocket motors.

M & T Company (Philadelphia, Pa.)--$138,000--Provide security guard service.

Cooper Bessemer Corp. (Washington, D.C.)--$177,000--Service and materials for helium compressor unit.

Chance Vought Corp. (Dallas, Tex.)--$300,000--Engineering, coordination, design, development, service and materials for launch facility at Pacific Missile Range.

Compudyne Corp. (Hatboro, Pa.)--$649,000--Construct free body dynamics facility.

Mt. Vernon Research (Alexandria, Va.)--$217,000--Construct environmental space chamber.

McDonough Construction Co. (Atlanta, Ga.)--$254,000--Modifications and additions to building.

GODDARD SPACE FLIGHT CENTER
Greenbelt, Md.

Space Technology Laboratories (Los Angeles, Calif.)--$100,000--Investigation and evaluation of thermal radiation properties of spacecraft materials.

Marquardt Corp. (Van Nuys, Calif.)--$73,000--Feasibility study of continuous flow magnetogasdynamic rocket for space propulsion.

Varian Associates (Palo Alto, Calif.)--$54,000--Optical pumping rubidium vapor magnetometers for EGO.

Telecomputing Corp. (Denver, Colo.)--$94,000--Develop reliable lightweight long cycle life silver cadmium secondary battery for satellites and space vehicles.

Vector Mfg. Co. (Southampton, Pa.)--$78,000--Transistorized FM/FM telemeter packages and subcarrier oscillators.

Hughes Aircraft Co. (Culver City, Calif.)--$1,500,000--Design, fabricate, test and deliver prelaunch and postlaunch support for 24-hour communications satellite spacecraft.

Air Force Systems Command (Washington, D.C.)--$800,000--Atlantic Missile Range support for Project Mercury.

Army Ordnance Laboratory (Redstone Arsenal, Ala.)--$95,000--Provide range support for Project Mercury.

Navy Bureau of Weapons (Washington, D.C.)--$600,000--Range support by Pacific Missile Range for Project Mercury.

Dept. of Agriculture, Research Center (Beltsville, Md.)--$120,000--Maintain and repair grounds, roads, and vehicles; also minor alterations and construction.

WALLOPS STATION
Wallops Island, Va.

Ampex Instrument Products (Washington, D.C.)--$63,000--Portable magnetic tape recorder/reproducer.

SPACE TASK GROUP
Langley Field, Va.

Massachusetts Institute of Technology (Cambridge, Mass.)--$1,750,000--Provide supplies and services for navigation guidance system development for Apollo.

MARSHALL SPACE FLIGHT CENTER
Huntsville, Ala.

J. T. Schrimsher Construction Co. (Huntsville, Ala.)--$411,000--Maintenance, repair, renovation and minor construction.

Rust Engineering Co. (Birmingham, Ala.)--$3,611,000--Addition to checkout building.

Young & Johnson Co. (Decatur, Ala.)--$80,000--Addition to building.

North American Aviation Corp. (Long Beach, Calif.)--$97,000--Rental of Recomp II computers.

Martin Co. (Baltimore, Md.)--$311,000--Heat exchanger assemblies for Saturn.

Radio Corporation of America (Princeton, N.J.)--$530,000--Develop payload capsule.

Dynatronics, Inc. (Orlando, Fla.)--$141,000--Demultiplexers, spare parts and manuals.

Chrysler Corp. (Detroit, Mich.)--$69,000--Install, fabricate and checkout helium storage vessels; plumbing; modify existing pneumatic lines.

Telecomputing Corp. (Monrovia, Calif.)--$458,000--Design, fabricate and install vehicle environmental control system for Saturn.

Noble Co. (Oakland, Calif.)--$56,000--Furnish and install inserts and blow-out panels for Saturn.

Parker Aircraft Co. (Los Angeles, Calif.)--$99,000--Design, develop and fabricate prototypes bang-bang universal modulating control valves.

Ryan Electronics (San Diego, Calif.)--$200,000--Design, develop, test and fabricate radar altimeters for Saturn.

Arde Engineering Co. (Huntsville, Ala.)--$76,000--Wind tunnel services for Saturn.

Noble Co. (Oakland, Calif.)--$95,000--Services and modifications for the Saturn service structure.

Air Force Systems Command (Patrick AFB, Fla.)--$70,000--MISTRAM transponder test set.

Army Ordnance Laboratory (Redstone Arsenal, Ala.)--$69,000--Additional funds for S-1 stage, ground support equipment, and development facilities.

Air Force Systems Command (Arnold AFB, Tenn.)--$300,000--Vacuum chamber propulsion tests.

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Immediate
November 17, 1961

RELEASE NUMBER 61-254

NASA SELECTS CHRYSLER TO BUILD SATURN S-I STAGE

The National Aeronautics and Space Administration will negotiate with the Chrysler Corporation, Detroit, Mich., for a contract to build, check out, test and launch the first stage of the Saturn C-1 launch vehicle, Administrator James E. Webb announced today.

Fabrication of the booster will be at the NASA Michoud Plant, 15 miles east of New Orleans, La., selected by NASA for this purpose earlier this year (NASA Release 61-201, September 7, 1961.)

Twenty S-I boosters would be constructed by Chrysler under the contract which would extend through 1966. The total estimated cost of the contract is about $200 million.

As part of the Chrysler S-I proposal, the Aerojet-General Corporation, Azusa, Calif., would aid in the static testing of the S-I stages and provide launch support at Cape Canaveral, Fla.

Ten S-I's -- prototype of the 20 Chrysler models -- are being built at NASA's Marshall Space Flight Center, Huntsville, Ala. MSFC will direct Chrysler's work at Michoud and elsewhere. Personnel from Chrysler would receive training at Marshall's Fabrication and Assembly Division at Huntsville prior to the beginning of S-I production at Michoud.

The Saturn booster, powered by eight H-1 engines, is 82 feet high and 22 feet in diameter. It is made up of eight 70-inch diameter tanks clustered around a 105-inch diameter tank. The propellant combination is liquid oxygen and RP-1 (kerosene).

The first S-I booster successfully underwent a flight test from Cape Canaveral on October 27.

(Over)

The advanced Saturn booster stage -- the S-IB -- also will be built at NASA-Michoud but by a different contractor. Five industrial proposals for this contract were received on November 8 and are under evaluation.

The fabrication plant -- formerly known as the Michoud Ordnance Plant -- currently is being rehabilitated for Saturn production. NASA is evaluating proposals from 35 companies to select a third contractor -- a "housekeeping" firm -- to maintain and service the plant.

The first Saturn S-I unit produced at Michoud will be shipped to Cape Canaveral in early 1964. After maximum production is reached at the plant, one unit per month will be produced.

Some Chrysler personnel would be assigned to Marshall and to Michoud in the next two months. By mid-1962, some 1800 people would be employed at the plant under this contract and peak S-I employment of about 2400 would be reached during the first half of 1963.

Thirty-seven firms were invited to the preproposal conference on the S-I contracts September 26 in New Orleans. Seven companies submitted proposals on October 16.

-End-

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON, D. C.

November 18, 1961
8:00 a.m.

RANGER II POST-LAUNCH STATEMENT

Ranger II was launched at 3:12 a.m. (EST). Apparently second ignition out of the Agena B did not occur and the spacecraft and Agena B went into a low earth orbit. Nature of the malfunction in the Agena B will not be known for some time -- until telemetry tapes from tracking stations come in and are analyzed.

The orbital elements are:

Period:	88.3 min period
Apogee:	145.7 statute miles
Perigee:	94.9 " "
Inclination:	33.3 degrees

There is no immediate estimate of lifetime.

Information from tracking stations indicates that the Agena B and Ranger did separate. On the first pass they were close together.

There are indications that the spacecraft orientation system is working or trying to work. That is, the system is trying to orient the spacecraft so that its solar panels see the sun, etc. There are also indications that the experiments are working, but since the spacececraft is not in an environment for which the experiments were designed, they will not be getting much, if any, useful information.

The spacecraft is in such a low earth orbit that the big dishes tracking it are on the spacecraft only for very short period of time and obtain only fragmentary information.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON, D. C.

November 18, 1961

BIOS I

JOINT NASA - NAVY STATEMENT

NASA and the Navy jointly announced at 11:10 A.M. P.S.T. today that NASA's Bios #1 spacecraft launched from PMR at 5:43 AM P.S.T. today has not been recovered.

It is not known whether capsule recovery devices performed as planned.

A quick look at DATA indicates a deveation in the Argo D-8 planned launch trajectory, but the DATA was insufficient to pinpoint the spacecraft's position accurately so that the recovery could be effected by the NAVY TASK FORCE.

Two search aircraft discontinued search at 10:20 A.M. P.S.T. and had to return to base because of low fuel.

Recovery ships however are expected to conduct the search for the remainder of the expected 30 hour lifetime of the battery which powers recovery aids.

Statement received from Bob Barracks
at 2:45 P.M. E.S.T.

Prot X

NASA

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: AM's Monday
November 20, 1961

RELEASE NO. 61-255

ELECTRIC PROPULSION PROGRAM TO LEWIS

The National Aeronautics and Space Administration today announced consolidation of its nuclear-electric propulsion program at the agency's Lewis Research Center, Cleveland, Ohio.

Nuclear-electric propulsion work at Marshall Space Flight Center's Research Projects Division, directed by Dr. Ernst Stuhlinger, will be transferred to Lewis. The urgency of Marshall's work on NASA's lunar and manned flight programs prompted the decision to employ Stuhlinger's group exclusively on those projects.

Transfer of the program to Lewis will be made within three months. The Lewis Center expects to fill staffing requirements of the program in that time.

Headquarters direction of the program will be by Harold B. Finger, Director of Nuclear Systems.

Forty-eight industrial contracts involved in the Marshall nuclear-electric program will be transferred. These range from study to hardware contracts for electric rocket engines and for the spacecraft which will test components of those engines in the vacuum of space.

The transfer will not affect the RIFT (reactor-in-flight-test) program which will remain at the Marshall Center. The RIFT program will flight test nuclear rockets as upper stages of large chemical boosters.

-End-

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST, WASHINGTON 25, D.C.
TELEPHONES: DUDLEY 2-6325 — EXECUTIVE [illegible]

FOR RELEASE: November 18, 1961

RELEASE NO. 61-256

INTERNATIONAL SATELLITE & SPACE PROBE SUMMARY

The following space vehicles are in orbit as of this date:

NAME/COUNTRY	LAUNCH DATE	TRANSMITTING
Explorer I (US)	Jan. 31, 1958	No
Vanguard I (US)	Mar. 17, 1958	Yes
*Lunik (USSR)	Jan. 2, 1959	No
Vanguard II (US)	Feb. 17, 1959	No
*Pioneer IV (US)	Mar. 3, 1959	No
Explorer VI (US)	Aug. 7, 1959	No
Vanguard III (US)	Sept. 18, 1959	No
Explorer VII (US)	Oct. 13, 1959	Yes
*Pioneer V (US)	Mar. 11, 1960	No
Tiros I (US)	Apr. 1, 1960	Yes
Transit I-B (US)	Apr. 13, 1960	No
Spacecraft I (USSR)	May 15, 1960	No
Midas II (US)	May 24, 1960	No
Transit II-A (US)	June 22, 1960	Yes
NRL Satellite (US)	June 22, 1960	No
Echo I (US)	Aug. 12, 1960	No
Courier I-B (US)	Oct. 4, 1960	[illegible]
Explorer VIII (US)	Nov. 3, 1960	[illegible]
Tiros II (US)	Nov. 23, 1960	[illegible]
Samos II (US)	Jan. 31, 1961	[illegible]
*Venus Probe (USSR)	Feb. 12, 1961	No
Explorer IX (US)	Feb. 16, 1961	No
Discoverer XX (US)	Feb. 17, 1961	No
Discoverer XXI (US)	Feb. 18, 1961	No
Explorer X (US)	Mar. 25, 1961	No
Discoverer XXIII (US)	Apr. 8, 1961	No
Explorer XI (US)	Apr. 27, 1961	Yes
Transit IV-A (US)	June 29, 1961	Yes
Injun-SR-3 (US)	June 29, 1961	Yes
Discoverer XXVI (US)	July 7, 1961	No
Tiros III (US)	July 12, 1961	Yes
Midas III (US)	July 12, 1961	Not Available
Explorer XII (US)	Aug. 15, 1961	Yes
Discoverer XXX (US)	Sept. 12, 1961	No
Midas IV (US)	Oct. 21, 1961	Not Available
Discoverer XXXIV (US)	Nov. 5, 1961	Yes
Discoverer XXXV (US)	Nov. 15, 1961	Yes
Transit IV-B (US)	Nov. 15, 1961	Yes
TRAAC (US)	Nov. 15, 1961	Yes

* In solar orbit; others in Earth orbit.

CURRENT SUMMARY (Nov. 18, 1961)

Earth Orbit:	US	- 3[illegible]
	USSR	- [illegible]
Solar Orbit:	US	- [illegible]
	USSR	- 2
Transmitting:	US	- 15
	USSR	- 0

COMPLETE SUMMARY (Launched to date)

Earth Orbit:	US	- 59
	USSR	- 13*
Solar Orbit:	US	- 2
	USSR	- 2
Lunar Impact:	USSR	- 1

** Lunik III passed once around the Moon, then into Earth orbit.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: UPON DELIVERY
About 8:30 p.m. EST

RELEASE NO. 61-257

Address by
James E. Webb, Administrator
National Aeronautics and Space Administration
before the
MANUFACTURING CHEMISTS' ASSOCIATION INC.
New York, New York
November 21, 1961

* * *

"Our National Program in Space"

Before the end of the decade, the United States plans to land a team of scientists and astronauts on the moon, to explore it, to take measurements, and to bring samples back to earth.

A great deal of work here on earth and out in space must go on in the intervening years. First of all, those aspects of the study of the space environment, which can be most effectively and efficiently carried out here on earth, will occupy some of our best brains in our best laboratories. The space-flight system, made up of the Mercury one-man space ship and the Atlas booster, will provide experimental proof of the forces at work both on an astronaut and his space ship as he performs his duties in orbit around the earth.

In the years just ahead, we will use the Mercury system for extensive research and development in manned space flight and for many scientific projects. However, there is a definite limit to what can be accomplished with a one-man space-flight system.

In addition to our work with Mercury, an active program of instrumented flights, outward to the moon, to land equipment on the moon, to take television pictures of its surface and to radio back information and data on which a manned landing can be undertaken, will go forward at an accelerated pace.

While the Mercury-Atlas space-flight system can carry only one man, the follow-on Apollo-Saturn or Apollo-Nova space-flight systems will be able to carry three men.

The success of this gigantic enterprise will depend upon the resources and initiative of a large part of our national technological-industrial complex. It will make special demands on the American chemical industry.

Rockets that burn chemical products will propel the lunar spacecraft. The air the crew breathes will be recycled and purified by chemical processes. The men, instruments, and life-support equipment on board will make use of electric power collected or generated and stored by fuel cells and other chemical means.

The Apollo spacecraft will incorporate materials developed, in part, through research and engineering in the chemical field. And on the return trip, layers of plastics and other materials produced by your industries will protect the exterior and insulate the interior, and thus the astronauts, from the searing heat of Apollo's meteor-like entry into the atmosphere.

Already a major, highly successful stride has been taken toward the rocket power needed for our Apollo lunar goal. On October 27, we launched from Cape Canaveral the initial test version of the first stage of the immense Saturn booster. Many of you may have seen it on television.

Of the 460-ton weight of the Saturn launch vehicle -- consisting of the first stage booster, plus two water-filled upper stages -- towering 10 feet taller than the Statue of Liberty -- 300 tons were made up of kerosene and liquid oxygen. Four seconds after the propellant was ignited, the eight rocket engines of the booster generated 1,300,000 pounds of thrust for the blast-off -- or some 28,000,000 horsepower. In less than two minutes, all 300 tons were pumped through the eight engines.

Electronic equipment radioed back quantities of information throughout the Saturn's eight minutes of flight. It reached an altitude of 85 miles, a peak speed of 3,590 miles per hour, and it came down in the Atlantic 215 miles downrange.

The Saturn booster has been under development for more than three years, having been started by the Department of Defense and transferred to the National Aeronautics and Space Administration in 1959. This illustrates that many of the activities now grouped in the National Aeronautics and Space Administration and forming the basis for the expanded lunar and space exploration program, have been under way for some time. The budget of the Space Agency, as recommended by President Eisenhower for the current year, amounted to $1,200,000,000.

Last spring, the President and Congress jointly established the goal of manned lunar exploration as a major part of an intensive effort to accelerate the development of space science and technology on as broad a basis and as rapidly as possible. In his State of the Union Message of May 25, President Kennedy stated that it was time for a "great new American enterprise." He recommended a national dedication to the goal of United States leadership in space. The President outlined a selective program to achieve the goal but emphasized that the decision should be made by Congress.

These recommendations Congress endorsed by appropriating $1,671,750,000 for NASA's Fiscal Year 1962 activities, enough money for the first steps in the speed-up. I think it is important to recognize that President Kennedy presented the program and Congress handled it on a bipartisan, or non-partisan basis.

The budget provided funds to shorten the lead times in developing large rocket engines and space vehicles; for speeding exploration of areas near the earth and the moon, and the space between; to expedite the Rover nuclear rocket engine; and to press forward toward operational weather and communications satellite systems.

NASA's 1962 program is approximately twice the size of that for 1961.

Here I would like to emphasize that 80 cents out of every NASA dollar is spent with industry and private organizations, for materials, supplies, salaries, research, development, and many other services. These expenditures not only assure for the United States a leading role in space, but the utilization and preservation of the great national resource represented by our aerospace and other defense-supporting industries.

This dynamic new venture into space promises to return a wealth of practical benefits to our country and to men everywhere. By the same token, we cannot allow our international standing in science and technology to slip to second place. In the eyes of the world, space achievements have come to symbolize over-all national progress and potential.

These are among the chief reasons why we are marshalling our resources to gain first place in manned exploration of space and why we are determined to meet its challenges.

Through Project Mercury, we will learn how man can withstand prolonged weightlessness, how well he can control a spacecraft, and how he can supplement from his own observations the data reported by the automatic sensing devices attached to his body and installed in the spacecraft.

Project Apollo, as an advanced manned space flight program, will capitalize on the pioneering results of Project Mercury and will have three major phases. First, the spacecraft will be launched into orbit about the earth, where for periods of up to two weeks, it will be employed to train astronauts and will serve as a laboratory where the crew can carry out scientific experiments under conditions of zero gravity and the "hard" vacuum of space, conditions impossible to reproduce on earth.

Next, will come flights deeper and deeper into space, leading to a flight around the moon.

The final phase will consist of the lunar landing itself.

The first Apollo phase of earth-orbital flights will be powered by the early-model Saturn, whose initial stage, as mentioned earlier, was test-flown successfully last month. The next phase -- that of deep-space flights -- will require a far more powerful rocket, a super-Saturn, which we have started developing.

For the Apollo expedition to the moon, two main approaches are being weighed.

In one approach, we will launch into earth orbit a special rocket unit capable of propelling the Apollo craft from this orbit on its 240,000-mile voyage to the moon, and for lowering it to the lunar surface. Later, the spacecraft carrying the lunar exploration team will be fired into the same orbit pattern as the big propulsion unit.

Once the second unit is in the proper orbital flight path, the Apollo pilot will use auxiliary rockets to overtake the main propulsion unit. He will maneuver the spacecraft so that the two units can be brought together and coupled. This is called the "rendezvous technique."

After the Apollo lunar vehicle is thus assembled, it will continue along its flight path or "parking orbit" around the earth. When it reaches the point in the orbit that is calculated as best for take-off toward the moon, the big propulsion unit will be ignited and the Apollo expedition will be on its way.

If this rendezvous and subsequent launching from orbit proves feasible, it can be accomplished with two Saturn boosters. If not, it will be necessary to develop a launch vehicle capable of firing the complete Apollo spacecraft to the moon directly from the surface of the earth.

The rendezvous approach, if practicable, could shorten our Apollo schedule considerably.

For the other approach, requiring more than 12,000,000 pounds of thrust, a giant booster called Nova, would be required to launch the Apollo in a direct ascent to the moon.

Regardless of which technique is selected, what will it be like on the flight to the moon?

Either way, the Apollo spacecraft must be accelerated to 25,000 miles per hour to offset the constant pull of the earth's gravity and continue to proceed toward the moon. This amounts to a velocity about 40 percent greater than that required for orbiting the three-man craft around the earth.

Using the speeds we now plan, the flight to the moon will take two and a half days, during which the crew will be weightless. Everything aboard must be fastened in place. Unless objects are so fastened, they will float free. The men will drink and eat from plastic squeeze bottles. Oxygen will be supplied and carbon dioxide removed. These are only a few examples of the conditions under which the crew will live and work.

Navigation will be a complicated problem. The moon, after all, is a relatively small target, 240,000 miles from earth, and orbiting the earth at a speed of 2,000 miles per hour.

The pull of the earth's gravity will slow Apollo's speed to about 6,500 miles per hour after one day, and to approximately 1,500 after two days.

On the last leg of the moonward course, however, the gravitational force of the moon will be more powerful than that of the earth. The spacecraft will pick up speed as it nears the moon. In the final approach, the pilot will fire a landing rocket and the spacecraft will descend to the surface.

On the first flights, the stay on the moon will be short, perhaps only a few hours. The exploration team will gather soil and rock samples and will check radiation. Photographs will be taken of surface features and of the heavens as viewed from the moon. Various other scientific investigations and measurements will be made.

Perhaps the most difficult part of the space mission will be starting the return flight. When you consider that each of the current launchings from Cape Canaveral involves hundreds of people on the launch pad, in the blockhouse, in the control centers, and indirectly many more at the check-out and tracking facilities -- it becomes clear that a lunar take-off with three men, all inside the spacecraft, will require the utmost in automation. The Apollo spacecraft and its attached lunar take-off rocket will weigh approximately 25 tons.

The homeward trip will take the same length of time as the outward-bound voyage -- two and one half days. The force of earth's gravity will steadily increase until the Apollo craft reaches a speed of 25,000 miles per hour.

The final, critical stage of the mission will be entry into the earth's atmosphere. Air friction will raise the surface temperature of the spacecraft to a peak as high as 5,000 to 6,000 degrees Fahrenheit, more than half as hot as the sun's surface.

The craft will have a moderate amount of controlability, enabling the pilot to land in the general area selected. The spacecraft will be lowered to earth by parachute.

The actions necessary to get a program of such magnitude under way have made the past few months a time of many decisions.

We analyzed the work to be done. We found it included more than 2,000 separate problems. We employed modern computing machines and advanced programming techniques, similar to those used in the Polaris missile program and by the du Pont Company and other firms.

We found that one of the pacing items was construction of launching and test facilities, and have taken the necessary steps to enlarge the Atlantic Missile Range at Cape Canaveral to more than five times its existing size. This is required for the very large boosters for the manned lunar program. This decision resulted from the work of a joint NASA-Air Force survey team.

On September 7, we announced the selection of a

Government-owned ordnance plant near New Orleans, as a fabrication site for large launch vehicle stages. This plant, at Michoud, had been in standby status for several years. Its use will facilitate the employment, through competition,of industrial contractors.

It is available to the deep water transportation necessary for the larger boosters.

We are acquiring substantial acreage in southwest Mississippi near the Michoud plant, to be used for the ground-testing of the boosters to be built there.

We have selected a site in Harris County, Texas, at the edge of Houston, for NASA's new Manned Spacecraft Center.

These decisions provide a four-location complex connected by water transportation. They supplement the major facilities we have at Huntsville, Alabama -- the Marshall Space Flight Center, managed by Dr. Wernher von Braun. In this complex, it will be possible to work most of the year outdoors.

Effective November 1, we completed a reorganization of NASA to provide greater emphasis on our major programs.

The nine NASA field centers now report directly to general management. Four new headquarters program offices have the responsibility for drawing on industry, university, and government resources, as needed, for establishing technical guidelines, for budgeting and programing funds, and for evaluating and reporting progress.

Some of the nation's most experienced and best qualified leaders have come to Washington to work in our space program. These men, and many others in the NASA program,know the technical side of aeronautics and space. They are experienced in the management of large activities.

It is fortunate for this nation that such men are willing to forego large earnings in industry and normal personal and family life to supply the leadership needed in our national space effort.

We are now in the process of recruiting about two thousand additional technically qualified men and women to strengthen our organization so that we can effectively contract out the bulk of the work. Any help you can give us will be much appreciated.

Tonight there is not time to discuss the 58 successful earth satellites and two sun satellites the United States has launched over the past four years, providing great advances in man's knowledge of space, the upper atmosphere and the earth as a planet. Nor is there time to cover our programs of satellite applications in weather forecasting and expanded world communications. Each of these programs is important enough to justify a separate speech.

In addition to these direct applications, the national investment in space research and development has produced new materials, metals, alloys, and compounds that have already gone into commercial production. Your industry has learned to produce liquid oxygen in volume and at low cost, partly because of the demand for its use as a rocket propellant. Liquid oxygen is finding ever wider use in the steel industry to make open hearth furnaces burn hotter and cleaner, and thus to make high-grade steel cheaper. Liquid nitrogen, a by-product of liquid oxygen manufacturing, is used to freeze whole blood for indefinite storage and to produce fresher-tasting orange juice than was obtained from previous freezing processes.

An even newer technology is that of liquid hydrogen, 423 degrees below zero Fahrenheit, more than 100 degrees colder than liquid oxygen. The upper stages of all of our more powerful launch vehicles are based on liquid hydrogen as a fuel -- first of all in the Centaur, which will enter the flight-test phase soon. Just last week, the engine for the Centaur successfully completedfiring tests on the ground. Liquid hydrogen increases rocket engine performance by 30 percent.

In using liquid hydrogen, we are capitalizing on a technology in which America is far advanced, thanks to pioneering research in the Bureau of Standards and technological developments sponsored by the Atomic Energy Commission. We cannot foresee at present what applications the private economy will make of developments such as these.

However, that they will prove of great value in an age of profound scientific and technological change can hardly be doubted.

In carrying out its responsibility, NASA cooperates with and depends upon private industry, universities, and many other government agencies -- not only the Department of Defense, the Atomic Energy Commission, and the Bureau of Standards, but the Weather Bureau, the Federal Communications Commission, the Federal Aviation Agency, the National Science Foundation, and others.

It has been only four years since the first man-made satellite orbited the earth. Since then, progress in this new field of space has been tremendous. I believe that in the years ahead the rate of progress will trace a steeply ascending curve. I believe also that the many problems we will solve to achieve manned exploration of space will create a wealth of new materials, consumer goods, processes, and techniques, thus opening a host of new jobs, careers, opportunities for investment, and a general national growth.

We can be first in space if we advance our scientific and technical knowledge at the most rapid rate possible, and if we go forward with the sustained effort that it requires.

That is the basis of our national space effort.

Thank you very much.

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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: November 23, 1961
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RELEASE NO. 61-258

FIRST ANNIVERSARY OF TIROS II

Tiros II, which was expected to have a useful lifetime of about three months when it was launched on November 23, 1960, is still transmitting cloud cover photographs as it completes its first year in orbit. And, recent pictures from the 285-pound hatbox-shaped satellite were of useable quality--about the same as when it was placed in orbit.

The remarkable performance of Tiros II -- which will make its 5,354th circuit of the earth today -- includes transmission of more than 36,000 photographs and nearly 4 million feet of magnetic tape containing meteorological information. From these pictures, two hundred and fifty nephanalyses (cloud analyses) were made within hours to provide a "quick look" at prevailing weather conditions.

Tiros II demonstrated the usefulness of meteorological satellites in many ways. In December, 1960, the satellite observed a cyclone south of Australia. In the same month, Tiros II photographs of a cloud mass approaching Australia were successfully used by meteorologists to predict the end of a severe heat wave on that continent.

In January, the satellite observed the tightly packed ice in the St. Lawrence waterway, and in March took photographs for several days which showed the breakup of the ice pack. These ice pack photographs were the first and best indications that weather satellites could be used to photograph and show construction of ice boundaries and the open sea areas.

The satellite's achievements beyond its photo-transmitting life expectancy included observations of a major storm off the tip of South Africa on July 31 and photographing a storm in the northwest Pacific Ocean on August 3rd. Tiros II also contributed information to the forecasts of weather conditions for suborbital flight of Mercury Astronaut Alan B. Shepard last May and the launch of Ranger I in July.

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As the satellite has aged, its power supply has lost some of its efficiency. Therefore, the number of pictures that can be taken during an orbit has been limited and the satellite is programmed only for "special assignments." Actually, Tiros II was taken off a full programming schedule after Tiros III was placed in orbit last July.

The infrared experiments in Tiros II were conducted with two radiometers. One of the two radiometers has optics which scan the earth as the satellite spins. The other performs heat balance measurements of the earth.

The radiation detectors in Tiros II, which have ceased to function, provided maps of the distribution of radiation, both reflected and thermal, over large areas. In addition to providing knowledge of the distribution of the energy balance these experiments have permitted the estimation of cloud heights and temperatures.

The first in the series of experimental meteorological satellites, Tiros I, was launched April 1, 1960 and clearly demonstrated the feasibility of meteorological satellites. During its transmitting lifetime of nearly three months, it relayed a total of 22,952 cloud cover photos, Tiros I carried no infrared experiments.

Tiros III, sometimes referred to as the "hurricane hunter satellite," was placed in orbit July 12, 1961. It, too, has exceeded its designed lifetime. As of November 13, it had completed 1,788 orbits, transmitting 31,529 photographs and a considerable amount of infrared data. Tiros III has photographed 18 tropical storms in all staged of development.

Observations from the Tiros satellites were studied by weathermen from all parts of the world at an International Meteorological Satellite Workshop, which ended yesterday. Meteorologists from 27 nations attended the workshop sponsored by NASA and the United States Weather Bureau.

The Tiros program is under the overall direction of the NASA Headquarters Office of Meteorological Systems, Dr. Morris Tepper, Director. The Aeronomy and Meteorological Division of the Goddard Space Flight Center is responsible for the execution of the program.

The Tiros satellites are designed and built under NASA contract by the Astro-Electronics Division of the Radio Corporation of America. The radiometers for the infrared experiments in Tiros II and III were built by the Barnes Engineering Company, under NASA contract.

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NEWS RELEASE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: November 21, 1961
Immediate

RELEASE NO. 61-259

NASA RECRUITING TEAMS TO VISIT NINE CITIES

Nine major U. S. cities will be visited in November and December by National Aeronautics and Space Administration recruiting teams looking for 2,000 scientists and engineers.

The recruiting drive was opened on November 3 by NASA Administrator James E. Webb (NASA Release No. 61-244). All NASA Centers are participating in the drive to fulfill their own specific professional personnel requirements.

Two drives -- one on the West Coast and the other in the East -- will be held simultaneously. NASA recruiting teams will be in each city about three days.

The West Coast drive opens November 27 in Los Angeles. Other dates are San Diego, December 1; San Francisco, December 5; and Seattle, December 9.

Dates for the eastern tour are Cincinnati, November 27; Pittsburgh, December 1, Philadelphia, December 7; Washington, D. C., December 12, and Baltimore, December 15.

Additional dates for drives in the northeastern, southeastern, and midwestern parts of the country are expected to be announced in January.

NASA recruiting teams already have visited three cities -- Chicago, Denver, and Phoenix. Some 175 interviews were conducted in Chicago; about 450 in Denver; and some 50 have been held so far in Phoenix where interviewing has just begun.

NASA Personnel Director Robert J. Lacklen said he was extremely pleased with the response to the recruiting tour so far.

"It is too early to state just how many of the very capable scientists and engineers we have interviewed will join the NASA team," Lacklen said. "But we are gratified with the interest shown by those who have contacted our recruiting teams."

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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: 12:30 PM, EST
Wednesday, November 22, 1961

RELEASE NO. 61-260

Meteorological Satellites

Luncheon Address Delivered by
Dr. Morris Tepper, NASA
to the
NATIONAL ROCKET CLUB
Washington, D. C.

* * * *

Mr. Chairman, honored guests at the head table, ladies and gentlemen:

When a friend of mine heard that I had been invited to address this group, he remarked, "Good, I'll be sure to come, and at last I'll find out all there is to know about meteorological satellites."

Well, "Meteorological Satellites" is an extensive subject, and although the Meteorological Satellite Program has been progressing exceptionally well, one cannot claim to have mastered all of the problems involved in this vast subject.

Undoubtedly, those of you -- that have come here with my friend's expectations -- will leave with many of your questions unresolved.

It may be somewhat like the story of the lady who sat behind the playwrite at the performance of his play. After the play was over, she tapped him on the shoulder and explained, "Sir, when your play began, I cut a lock of hair from the back of your head for safekeeping. But now that it is over, I would like to return it to you."

To those of you, who will wish to return a lock of my hair to me, after the conclusion of my address -- to you I say -- "Please do -- I certainly can use it!"

Scientists, researchers and innovators throughout the ages have been confronted by their more practical neighbors with a query somewhat as follows, "Look here, what you are doing is all very interesting -- but of what use is it?"

When the investigations referred to involve the expenditure of considerable sums of money, and particularly when these are public funds, the question is usually asked more frequently and with greater emphasis. Moreover, unless the answer is clear and acceptable there is considerable reluctance to provide these funds. A recent newspaper cartoon depicted this situation. It showed Columbus in the court of King John II of Portugal asking for financial support for his westward voyage to the Indies. The monarch is shown exclaiming, "$26,000! Why, for such a sum a man can go all the way to the moon!"

Well the development of meteorological satellites and their launch into orbit is an expensive proposition -- and the funds involved are indeed public funds. Frankly, they are much more than $26,000 -- but insufficient, I'm afraid, to take a man to the moon.

Consequently, it would be appropriate to address ourselves first to the basic question, "Of what use are meteorological satellites?"

In order to answer this question, it is necessary to consider briefly the nature of the atmosphere, its relation to the understanding of weather processes and finally how both of these are vital to the prediction of weather in any localtiy.

The atmosphere has been described as an ocean of air surrounding the entire earth -- and man lives at the bottom of this ocean of air. The atmosphere -- just like the oceans of water -- is in constant motion, moving in response to many internal and external forces. It crosses over, or circumvents mountain barriers. In its travel it may absorb moisture from water surfaces or heat from underlying areas having higher temperatures. The atmosphere may condense its moisture in the form of fog, rain or snow when it is cooled either by radiation to space or when it is forced upward to higher elevations as in its transit over mountains. Ofttimes, air masses of tropical origin meet with polar air masses. Their boundary -- the frontal zone -- is frequently a region of stormy weather.

A meteorologist, concerned with forcasting for a particular city -- say Washington -- tries to understand the nature of the meteorological events that will transpire in his locality during the forecast period. He must determine whether the primary air mass will be tropical or arctic. He must be able to time accurately the arrival of the front -- the boundary between two air masses -- in order to alert the public to possible storminess. He must know whether the air mass has had a long journey over water, and so will contain much moisture, or whether it has come over a drier land area. He must know whether the air mass will be moderately or exceptionally warm -- or cold.

These are but a few of the things he must know. In fact he must know much, much more about the atmosphere.

Of particular significance is the fact that he must know all of these things in areas far removed from his specific locality.

He realizes that he must observe, describe and understand the behavior of the atmosphere over a large portion of the globe, if he is to explain and predict, with any satisfactory degree of confidence, the weather events in his particular locality.

Since they share this identical problem, meteorologists from many countries have organized themselves, through the instrument of their national weather services, into the World Meteorological Organization by means of which the rapid exchange of current weather information is brought about. This weather information crosses national borders, man made walls and curtains daily -- and in vast numbers.

Despite this willing participation of men in many countries in observing the atmosphere and in sharing these observations for individual and mutual benefit, it is unfortunate, but unavoidable that the observations are restricted primarily to those regions regularly frequented by humans. Events in desert, polar and oceanic areas -- for the most part -- remain undetected, and consequently the information concerning their contribution to the overall atmospheric motion pattern and to the associated weather cannot be made available to the meteorologist on a regular basis. It is only when these events move out into inhabited areas that their presence becomes known. By this time, it may be too late to issue the necessary kinds of warnings for the protection of life and property.

For example, some of the most destructive storms that frequent our southeastern states -- the hurricanes -- are of tropical origin. They form near the equator in those oceanic regions that are practically devoid of weather observations. Quite frequently, the first knowledge of the existence of such a storm comes about when it strikes an island, ship or continental shoreline.

It is primarily in this regard, in being able to view weather events anywhere on earth, that meteorological satellites have their greatest value. Satellites can scan data sparse ocean regions and provide early detection and accurate tracking of storm systems. As you know, TIROS III illustrated this point very dramatically. It observed the early formation of a storm vertex in the tropical Atlantic. Two days later aircraft reconnaissance verified this and the storm was officially named Hurricane Esther.

Even over land areas, where we have a greater density of observing stations, satellites are able to observe, in detail, the development of local storms of the kind that ofttimes are too small and too transient to be identified and tracked by means of the regular observational network.

Moreover, in the last analysis, the energy for atmospheric motions comes from the sun. With satellites, situated above the atmosphere, we may measure the net balance between the solar energy input and the outgoing earth reflected and radiated energy and thus have a measure of the remaining energy, the energy available for driving the atmosphere.

All of this means that by means of meteorological satellites we shall be able to view weather events globally and thus obtain a better understanding of what is happening within the atmosphere over the entire earth. Out of this understanding will flow an improvement in weather charting and forecasting. In addition, this understanding will form a more scientific foundation on which it will be possible to build and develop methods of weather modification or control. Estimates of the benefits to be derived from such advances have run into the hundreds of millions of dollars, considerable savings of human lives and appreciable contributions to human comfort.

I shall leave it as an exercise for the statisticians and economists to assign more specific numbers to this list of benefits.

These are the things that we feel we shall be able to accomplish with meteorological satellites. We are confident, moreover, that there shall be other benefits, benefits which we cannot foresee at present.

Should there still remain a few skeptics in the audience who wonder about the benefits from meteorological satellites, for these skeptics I would like to relate a story which my good friend, Dr. Schulman, tells about the famous electrochemist, Michael Faraday, who lived more than 100 years ago.

Faraday had received a grant of 5000 per year from Parliament to conduct his research in electromagnetism. After several years, an alert member of the House of Lords discovered that this stipend had been paid out for quite a while, and he raised the question in Parliament as to what benefits were being derived from all this money. A committee was appointed to look into the matter. This may be the first Congressional Investigations Committee on record. Well, the committee visited Faraday's laboratory and was shown the busy activity there. Finally, with great pride Faraday showed the committee how, by moving a magnet through a coil of copper wire, he caused an electric current to flow in the wire. He then awaited the committee's reaction with great anticipation. The members of the committee huddled together in conference for a few moments and finally the chairman remarked, "Mr. Faraday, the committee finds this all very interesting. But of what use is it?"

Faraday was speechless for a moment and greatly chagrined. He finally answered, "My Lords, I don't know of what use all this is. But of this I am certain -- some day you'll tax it!"

I cannot speak with the same prophetic insight about meteorological satellites, that some day they will be taxable. But as I have already stated, what we have learned from these satellites, the benefits which we have derived from them to date, and those we expect in the future are only the beginning. Without doubt, additional, currently unimagined returns will derive in the years to come.

What, then, are the results of the meteorological satellite program to date?

We point with pride to the successful launch and operation in orbit of TIROS I, TIROS II and TIROS III. With the exception of a few months last fall, these satellites have given us almost continuous satellite observations since the launch of TIROS I on April 1, 1960.

More specifically, these TIROS satellites have demonstrated the following three important facts:

First, their successful launch and operation in orbit have demonstrated that a spacecraft and supporting ground systems can be developed around special sensors, i.e., vidicon cameras and radiation detectors, and could transmit the measurements of these sensors to earth with satisfactory fidelity. This remarkable performance required the successful operation of many interdependent and delicate subsystems, components and electronics. In a few instances, new and previously untried technological advances were made.

Second, it was found that the satellite measurements contained much useful meteorological information. The research with the data has indicated that excellent correspondence exists between the satellite data and meteorological patterns. Some of these relationships included:

> Spiral cloud formations associated with low pressure storm centers, cold fronts, large areas of stratus and fog, convective areas having cellular shaped clouds, bright isolated cloud masses characteristic of severe local storms, jet stream clouds, distinctive mountain clouds. The condition of sea ice was observed and the way it breaks up. Differences in solar reflections from water surfaces have yielded inferences on the nature of sea activity.

Third, it was demonstrated that this useful meteorological information could be extracted from the satellite data and transmitted to the weather services, in time to be of assistance in daily weather analysis and forecasting operations. The weather teams stationed at the TIROS read-out stations analyze the data, as they are received from the satellite, and send these analyses to the National Meteorological Center of the Weather Bureau in Suitland, Maryland. This information is incorporated into the regular analysis and forecasts of the Weather Bureau, and copies are relayed to our military weather services both in this countrv and overseas. It is also made available to foreign weather services When an event of special interest to a particular country is observed, the Weather Bureau sends a special message to that foreign weather service to alert it to the potential danger. For example, in connection with the typhoons and other weather developments observed by TIROS III, the Weather Bureau sent some 50 special advisories by telephone, telegraph and radio to the countries likely to be effected. The U. S. Weather services have reported that this information from the TIROS satellites "established, confirmed or modified surface frontal positions; assisted in the briefing of pilots on accurate weather conditions; were used in direct support of overwater deployment and serial refueling of aircraft; gave direct support to an Antarctic resupply mission; confirmed the position of a Pacific typhoon; discovered Hurricane Esther in its formative stages; tracked five hurricanes and one tropical storm in the Atlantic, two hurricanes and one tropical storm in the eastern Pacific and nine typhoons in the central and western Pacific, verified and amplified local analyses, particularly over areas with few reports..." The list goes on and on.

These accomplishments are impressive indeed -- despite the fact that the TIROS satellites cannot provide full global coverage of weather events. As you know, TIROS is spin stabilized in inertial space and its launch places it in an inclined orbit around the earth. As a result of these two facts, the TIROS cameras scan only about 25-40% of the earth under each of the orbits, and there is no data coverage of the polar regions. The Nimbus family of satellites is being developed to correct both of these deficiencies. Nimbus will be earth-oriented at all times and its sensors will always face the earth. In addition, Nimbus will be launched in a quasi-polar orbit (80° retrograde) and will view each area of the earth twice a day at about 12 hr. intervals.

The first satellite in the Nimbus series is scheduled to be launched late in 1962 with subsequent launches at about six-month intervals.

In the meantime, however, in order to provide for the continuous operation of a meteorological satellite in orbit through the first successful Nimbus launch, we have scheduled four additional TIROS launches beyond TIROS III.

The first Nimbus will be primarily a research and development spacecraft. Nevertheless, as with the TIROS satellites, it will be used to provide data for operational purposes. Plans exist for sending the data from Nimbus, in real time, from the Command and Data Acquisition Station at Fairbanks, Alaska, to the National Meteorological Center in Suitland; there they will be analyzed and the resulting weather information distributed to the field weather services.

The effectiveness of the operational utilization of the TIROS data, and the potential contained in the plans for the Nimbus series, have fired the imagination of the weather services with regard to the early implementation of an operational system. Earlier this year, an interagency panel of experts -- the Panel on Operational Meteorological Satellites -- drew up a plan for such a system and for its evolution. The plan considers an ultimate system having several satellites in different orbits at one time and read-out stations both in the United States and abroad. Communications radio links connect the satellites with the read-out stations and surface data links connect the read-out stations with the national weather central at Suitland.

This plan has received wide agency support, and in the Spring President Kennedy requested funds from Congress for the Weather Bureau to begin implementing the recommendations of the proposed plan. Congress, this summer, appropriated $48 million to the Weather Bureau for this purpose.

From its earliest inception, Nimbus has been planned to serve as the basis of the spacecraft for the initial operational meteorological satellite system. The funds that have been appropriated will permit the augmentation of the Nimbus R&D program with additional spacecraft, the purchase of suitable launch vehicles, and the construction of special read-out stations specifically for operational use. The Weather Bureau will transfer funds to the NASA to accomplish these things.

Now, what lies on the horizon beyond Nimbus?

We have in mind another family of satellites -- Aeros. The Aeros satellites are planned for launch into a stationary orbit of 22,300 miles and thus will appear not to move relative to the earth. They will have on board cameras with differing focal lens and will be able to view the evolution of a weather system in varying detail. This will be particularly important for the identification and tracking of short-lived storms where the entire life history may only be a matter of a few hours. It will also be invaluable for monitoring those oceanic areas which are hurricane breeding grounds.

Under present plans, the first Aeros satellites will be launched during the mid 1960's.

From a longer range point of view, and following the termination of the currently scheduled Nimbus series, we expect to launch about one R&D meteorological satellite a year (in addition to those in the Aeros series). In this advanced research and development program, we shall endeavor to develop and test improved or new systems, to be incorporated, as they become proved out, into the operational system. Furthermore, these flights will be used to obtain additional data found necessary to further improve our understanding of the atmosphere and to develop better ways to analyze and forecast the weather.

In my opening remarks, I referred to the atmosphere as a global phenomenon and meteorology as an international science. We well recognize this in the meteorological satellite program, and we realize that maximum benefits will be derived only through international cooperation and participation. Thus together with the Weather Bureau we have developed or are planning for the following international activities:

1. We transmit satellite meteorological analyses to foreign countries.

2. We have made available to all, copies of the TIROS data. These may be acquired from the National Weather Records Center at Ashville, North Carolina.

3. We have instituted programs of supporting meteorological observations on the part of foreign weather services. It is well recognized that satellite information is more useful when combined with other meteorological observations. In connection with the TIROS efforts -- and we shall continue this in future programs -- we provide necessary satellite orbital information to foreign national weatherservices in the event they wish to make special observations in their own country which could be correlated with satellite observations there.

4. We have just concluded the first International Meteorological Satellite Workshop in Washington. Thirty-seven meteorologists from 27 countries plus representatives from international scientific organizations -- WMO, IUGG and ICAO, as well as representatives from other interested groups in this country have met for a ten day workshop. Scientists from the NASA and Weather Bureau spoke to the participants on the results from the current TIROS series and on the plans for future programs. There were field trips to Goddard Space Flight Center, to Wallops Island and to the laboratories of the Weather Bureau. There were three days of intensive laboratory work, to give the participants practice in using actual satellite photographs and radiation data for preparing weather analyses. It is no exaggeration to report that the foreign participants were greatly impressed and inspired. Particular interest was shown by the representatives of those countries

having limited weather observing and forecasting facilities. We hope that such workshops will become regular international events where meteorologists from all over the world will meet and exchange information on the processing of meteorological satellite data and their use for forecasting and research.

5. We are formulating plans for including at least one non-U.S. command and data acquisition station for use in the fully operational system. Such a station is required if we are to acquire data from all the Nimbus orbits.

6. We are considering the problems involved in the development of non-destruct read out, as an initial step toward providing any country with the opportunity to read out satellite data directly. We are also looking into other possibilities.

7. Finally, we are looking to the time when we might have international participation in a Unified Global Operational Meteorological Satellite System. One can foresee a future truly international operational system resulting from the coordinated efforts of many countries, in which there will be many satellites in different orbits transmitting global observations to a world meteorological center and more limited data directly to regional, national and local weather centers and stations. The world center would concern itself with global analyses and longer period forecasts while the other centers will concentrate on the meteorology of a more local nature.

All of this may sound like so much day-dreaming - but after all, it is from such dreams of today that the reality of tomorrow springs.

Mr. Chairman, you have done me the honor of identifying me with this important program. Now, with your permission and that of the audience, I would like to conclude by acknowledging the contributions of others. I am particularly gratified that several of these individuals are sharing the head table with me.

Mr. Stoller, my boss, is in a sense representing all of NASA top management which has given us the encouragement, support and resources required for the program.

Dr. Goett is the Director of Goddard Space Flight Center, the laboratory which has been given the responsibility of executing the various projects in the program.

Mr. Stroud, the Chief of the Aeronomy and Meteorology Division, GSFC, has, more than any other single individual, made possible the engineering marvels which we have been discussing today.

Mr. Kreutzer of RCA and Mr. Paige of General Electric represents the two corporations having primary industrial responsibility for the development of TIROS and Nimbus, respectively.

The Weather Bureau has provided the necessary meteorological guidance in the over-all program and the leadership for the utilization of the data, both for research and timely operations.

The departments of the DOD and FAA have assisted us in the planning and data problems.

Several university groups are participating in the data analysis and many many industrial concerns contribute in one way or another in the manufacture of the satellites, launch vehicles and ground support systems.

So you see, all in all, this program is the joint effort of many individuals, many agencies, universities and companies. As for myself, I have found it an exciting, stimulating, educational and rewarding experience to be associated with this program. Thank you.

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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: Immediate

RELEASE NO. 61-261

FUTURE PLANS FOR THE X-15

Presented at the

THIRD X-15 CONFERENCE

Edwards Air Force Base, Calif.

November 20-21, 1961

(By Paul F. Bikle, Director of the NASA Flight Research Center and Lt. Col. Edwin F. Pezda, X-15 Project Office, Wright-Patterson AFB, Ohio)

This third X-15 conference has given us an opportunity to review and evaluate, in considerable detail, the progress that has been achieved in the flight research program to date. It appears that we are well down the road on the work that we set out to accomplish with perhaps 50 per cent of the aerodynamics, structures, heating, and bioastronautics information already obtained.

The X-15 program for the immediate future will be oriented toward continuing the research investigations in flight characteristics at high angles of attack, aerodynamic heating, reaction controls, adaptive control system performance and display and energy management. Determination of the flight characteristics at high angles of attack, in the range from 15 degrees to 25 degrees, are required before attempting flights above the 250,000 foot design altitude. Aerodynamic heating information has been of great interest thus far in the program; a number of future flights will be pointed in this direction. Reaction control research data are just now becoming available from the flight program; future flights at high altitude and low-dynamic pressure should be of great interest in this area.

An important feature of flights to come will be the incorporation of rate damping in the reaction control system. The flight behavior with both the stability augmentation system and the reaction rate augmentation system will be compared to the flight behavior with the adaptive control system described earlier

(Over)

in the conference. During these flights, data will also be obtained to more completely define the lift and drag characteristics of the X-15 configuration. Work on displays and energy management will be continued. In this particular case, the goal is to provide a working on-board display for the use of the pilot in selecting his landing site.

A flight to the 250,000 foot design altitude will be attempted as soon as a satisfactory modification to the windshield has been designed. Altitude exploration flights above 250,000 feet will be initiated after the installation of a back up stability augmentation system, sometime after March of 1962. Future altitude exploration flights are planned to acquire information between 200,000 and possibly 400,000 feet at speeds from 2,000 to 5,500 feet per second. Of major interest in this phase of the program will be such piloting aspects as display, guidance, precision of control, and bioastronautics.

As these programs are completed, follow-on programs will explore, with new instrumentation, areas already partially investigated, such as display, boundary-layer noise, skin friction at high Reynolds numbers, and structural panel tests. A large number of space experiments have been proposed which make use of the X-15 as a test bed to obtain information at altitudes from 150,000 feet to possibly 350,000 feet; heights greater than those obtained by balloons but lower than satellite altitudes. These experiments capitalize on the ability of the X-15 to provide on-the-spot pilot input in the conduct of the experiment and the return of the experiment to the ground for detailed evaluation and adjustment or correction of deficiencies if required.

We are now in the process of evaluating the many proposals that have been made. Some of the experiments will ride free in piggy back fashion. Others may be grouped together to share the cost of operation. Some require extensive modifications and are expensive in both time and money. For example, a stellar photographic experiment which would involve a stabilized platform extended through clam shell doors from a modified instrument bay.

It appears that the completion of the present research program will require about 30 flights in the next 18 to 24 months. The extent to which the addition of worthwhile follow-on experiments will extend the program is to be decided by the Research Airplane Committee, Admiral Hayward, Major General Demler, and Dr. Dryden. A recommended follow-on program is now being prepared for consideration of this Committee.

Here, I think that there is a point that needs to be made about the degree of reliance, or degree of certainty, in any future plans involved with a research program. A future plan can only be as good as one can estimate what the problem areas are going to be--both problem areas in the X-15 and problem areas in other programs which may require information from the X-15. For example, when the X-15 was first approved, the objectives were clearly stated in terms of aerodynamic heating, speed, altitude, reaction control research, and bioastronautics.

As the program has progressed, I have come to the conclusion that, while these worthwhile objectives have been or will shortly be achieved, many important benefits have been of a different sort. The X-15 program has kept in proper perspective the role of the pilot in future programs of this nature. It has pointed the way to simplified operational concepts which should provide a high degree of redundancy and increased chance of success in future space missions.

And, perhaps most important, is the fact that all of us in industry and in the government who have had to face up to the problems of design, building the hardware, and making it work have gained experience of great value to the future aeronautical and space endeavors of this country.

The same type of seemingly intangible consideration will influence our future X-15 program. The future program will be kept flexible and will be modified, extended or terminated on the basis of timely reviews by the Research Airplane Committee.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: NOV 29 1961

Address by

Thomas F. Dixon, Deputy Associate Administrator
National Aeronautics and Space Administration

before the

Greater Los Angeles Press Club
Los Angeles, California

November 29, 1961

Release No. 61-262

I am pleased and honored at the invitation to return for a visit to this center of so much vital work in the national space program. Particularly, I am happy to address members of the Greater Los Angeles Press Club and their guests, among whom are many friends of long standing.

I wonder whether you realize just how extensive is the participation of the Los Angeles area in the NASA program. The ten largest contracts we have in this area total more than a half-billion dollars and we are negotiating contracts that will bring the total near $700 million. Rocketdyne Division, North American Aviation, is building rocket engines at Canoga Park. The Jet Propulsion Laboratory at Cal Tech in Pasadena is providing technical management for our lunar and interplanetary programs. Douglas Aircraft at Santa Monica is developing and producing rocket vehicles. At San Diego, General Dynamics is producting the Atlas rockets that will boost American astronauts into orbit, and the Centaur, our next-generation booster. Aerojet-General is doing nuclear work for us at Azusa. Space Technology Laboratories is developing a large multi-purpose satellite for NASA here in Los Angeles. And at Downey, the Space and Information Systems Division of North American Aviation will develop a second stage for the mighty Saturn, the largest rocket development project undertaken to date by private enterprise.

All of these projects are part of a unified national program, which was accelerated earlier this year. I want to emphasize that this is a national program. It is not just a NASA program. It is not just a government program. It is a program to mobilize America's manpower and resources to meet the goals we have set for ourselves in space. These goals bear restating and emphasizing.

First and foremost, we intend to land a U. S. scientist-astronaut team on the moon before this decade is out. We are confident that we can do this, with the wholehearted support of the American people.

We are carrying out vigorous research and development work toward the establishment of operational satellite systems of practical use--for weather observation and to expand the channels of worldwide communications systems. We are cooperating closely with the military services to insure that they gain the full benefit of technical developments produced by our programs.

We are pressing forward in the development of new space technology -- in electronics, spacecraft design, propulsion and power generation, and in nuclear systems. The Rover nuclear rocket is progressing as rapidly as the technology will allow. We expect that the nuclear rocket will provide the basic means of propulsion for manned missions beyond the moon in the next decade.

Finally, we are paying full attention to our responsibilities in aeronautical research. We are moving as swiftly as possible in research leading to the development of a supersonic civilian transport, vertical take-off and landing craft, and solution of pressing problems of aviation safety and the sonic boom.

In carrying out its responsibility for the national space program, NASA is and will continue cooperating with, and depending upon the skills of numerous other government agencies -- the Department of Defense, the Atomic Energy Commission, the National Science Foundation, the National Academy of Sciences, the Federal Aviation Agency, and others.

To achieve national space goals on the accelerated time schedules that the Executive and Legislative branches of government have laid down, we rely primarily on industry to do the bulk of the job. Eighty cents of every dollar that NASA spends goes for contracts with industry and other private organizations. As the job assigned to private industry grows, it follows that there must also be growth of the NASA in-house staff since we must have competent scientists, engineers, and managers on our own staff, to follow contractors' work in every phase from start to completion.

In addition, we are cooperating closely with the scientific community, in the United States and abroad, to assure steady advances in the space sciences, which underlie all technological improvements. In this country, we have worked out plans for much greater use of university scientists. Abroad, we are expanding our cooperative arrangements with foreign scientists and world scientific organizations.

A good example was the International Meteorological Satellite Workshop held earlier this month in our Washington headquarters, attended by representatives of thirty nations. As NASA Administrator James E. Webb pointed out in his opening remarks, the conference demonstrated anew that America intends to apply to practical use and to share with all the world the knowledge and skills we develop from our exploration of space.

I am sure it is unnecessary to say before a Southern California audience why we must make strong efforts to pursue our national goals in space. Nevertheless, I believe the underlying reasons bear repeating.

First, by achieving a pre-eminent position in space, we assure our nation against space flight capabilities being used to put pressure on us and our friends in the Free World. Second, the economic stimulus, the knowledge and the new products that develop will ultimately return values far in excess of the expenditures. Third, exploring space, the moon and the planets is of immense scientific importance -- productive of information that will be used for the benefit of mankind in ways we cannot possibly foresee.

Project Mercury, the first phase of the United States program of manned space flight, will place an astronaut in orbit about the earth. The flights in Project Mercury and immediate follow-on missions will establish baselines of knowledge about what man can accomplish in space -- how he can withstand prolonged weightlessness, how well he can operate controls and instruments, what he can observe to supplement the information recorded by electronic devices -- in short, how man's intelligence can be put to work as an integral part of a space vehicle system.

The two suborbital flights this year -- by Astronauts Alan Shepard and Virgil Grissom -- provided a great amount of information that has been useful in establishing the final designs and plans for the manned orbital flights that will begin shortly. An important milestone on the way to manned orbital flight was Mercury-Atlas IV on September 13, in which an unmanned capsule was injected into orbit, traveled once around the earth and was recovered an hour and 49 minutes after launch by Navy personnel in the Atlantic Ocean.

Our most far-reaching firm plans for manned exploration of space are built around Project Apollo, in which a spacecraft carrying three men will conduct a series of flights culminating in the landing on the moon. The last six months have been a time of great decisions on this vast program. During the spring and summer, the goals were established through the President and Congress, acting in a fully bipartisan manner. Now it is up to us in government and industry to work to carry them out.

Congress approved for NASA a budget that appropriated $1,671,750,000 for the fiscal year that ends June 30. Even before Congressional action on the funds was completed, NASA began making a series of major decisions on the nature and scope of the program. They had to be made promptly. NASA 1962 program is approximately twice the size of that for 1961 and the program will continue to increase over the next several years if we are to meet our national goals. In a preliminary analysis of the program to land men on the moon, we learned that one of the pacing items was construction of facilities. Several of the first decisions that had to be made involved the location of facilities for launching the rocket and spacecraft, for building and testing the rockets and for designing, evaluating, and testing the spacecraft.

Project Apollo will have three phases. In the first, the three man spacecraft will carry out missions in relatively low orbits about the earth, for periods up to two weeks. The second phase will consist of flights deeper and deeper into space, culminating in a flight around the moon. That flight may be followed by a flight into orbit around the moon. The final and most dramatic phase will be the landing on the moon.

As you know, our goal is to land a scientist-astronaut team on the moon before the decade is out. The program is long and complex. We are pressing forward on all parts of the job -- boosters, upper-stage vehicles, spacecraft research into conditions on the moon's surface and in the space in between, and the study of man's capability to perform and survive in the conditions of space flight and on the moon. Thousands of problems must be solved. Our complete program is laid out on a schedule that calls for the lunar landing during the last few years of the decade.

To remain on schedule, NASA has been moving at top speed. In the last few months, these first steps have been accomplished:

-- Launch and test facility sites have been chosen and engineers have been put to work on designs for both.

-- A successful first flight of the Saturn C-1 booster has been conducted.

-- Steady progress has been made in Project Mercury toward the goal of manned orbital flight.

-- A contractor - MIT Instrumentation Laboratory -- has been chosen to develop the guidance and navigation system for the Apollo spacecraft.

-- The Ranger program of unmanned landings on the moon has been expanded to provide more assurance of early information about the lunar environment -- so that we will know what steps to take to protect the men who follow.

-- A contractor - North American Aviation - has been chosen for the development of the Saturn S-II stage, the largest such project attempted to date by private industry.

-- NASA has been reorganized to provide better focus and greater emphasis on major programs such as the lunar landing.

-- A contractor - Chrysler Corporation - has been chosen to operate a plant at New Orleans to produce the S-I Saturn stage, which was flown so successfully for the first time last month from Cape Canaveral.

Within the next few weeks, we plan to award a contract to industry for research and development of the Apollo spacecraft. The Apollo capsule will be roughly cone-shaped, with a probable diameter of 14 feet across the base and a height of 12 feet from heat shield to the tip of the cone. Apollo will have an abort tower somewhat similar to that of the smaller Mercury spacecraft. Behind will be a propulsion module, which will consist of on-board rockets that will vary in size and design according to the particular mission.

Ten of the first vehicles of the Saturn S-I stage are being produced at the NASA Marshall Space Flight Center--while it is in the research and development stage. But we expect that the production versions produced by Chrysler will be phased into the flight schedule before the research and development models run out. The government will provide the production facilities in New Orleans, at our recently selected Michoud Operations, Marshall Space Flight Center.

However, the S-I contractor will take up only part of the space at Michoud. In another portion of the huge facility, a second contractor, to be chosen very shortly, will fabricate a larger rocket, which will be the first stage of an advanced version of Saturn. Concurrently with the design, development and fabrication of these large stages, we will test and launch the advanced Saturn.

The next version of Saturn must provide enough propulsion energy for a flight around the moon. The original plan--before the requirements were analyzed in detail--called for a relatively modest redesign that involved addition of a new second stage to the basic components of the Saturn C-1. But detailed analysis showed that the early design of the advanced Saturn would have little margin of safety. We have determined that the large program will be carried out with adequate margins. Too often in the past, the United States space efforts have been hampered by the rocket-spacecraft squeeze. It is almost an axiom in this business that the performance capability of a rocket decreases every few months as development progresses, while the weight of payloads increases just as steadily.

To avoid being caught in such a squeeze, we are planning that the advanced Saturn will be much more powerful than was envisioned originally. The first stage of the advanced Saturn could have two to five engines of the so-called F-1 design. The F-1, the most powerful single rocket in the United States arsenal at present, is being developed by Rocketdyne here in the Los Angeles area--at Canoga Park--and is being tested at Edwards Air Force Base. The F-1 will develop a thrust of 1.5 million pounds--as much as all eight engines of the early Saturn model.

The first mission of the advanced Saturn will be Phase 2 of Project Apollo, the series of flights leading up to a flight around the moon. But a single advanced Saturn does not provide enough power for the lunar landing itself. For that mission, we shall have to decide shortly whether to rely primarily on direct ascent or rendezvous in orbit about the earth. If we fly by direct ascent, with all-chemical rockets, we must build a much larger launching vehicle--the Nova--whose first stage might be a cluster of eight F-1 engines, with a total thrust of 12 million pounds. The Nova is a tremendous engineering project.

Our studies indicate that the techniques of rendezvous may save some of the long lead time associated with the development and testing of the Nova, since the required rockets would be smaller. On the other hand, it might take as much time or more to develop the techniques of rendezvous to the point where it would be safe to conduct a flight to the moon. Probably the best solution to the rendezvous approach is to limit rendezvous contacts to a minimum--that is, a single docking maneuver involving two vehicles. If the number of objects to rendezvous is held to two, then the basic booster would probably require four, or perhaps five F-1 engines in its first stage.

If we should decide on this advanced Saturn as the basic unit for the lunar landing, there would be two launches for the mission to the moon. First, an advanced Saturn would launch into orbit a large, fully fueled rocket stage weighing upwards of 160,000 pounds. The tracking system would follow it very carefully to determine the exact parameters of its orbit. When that is established, after a day or so, a second advanced Saturn would launch a manned Apollo capsule for an attempt to achieve rendezvous. If the two can be joined together, then the combination will be launched from orbit at a carefully calculated moment on the journey toward the moon.

If the rendezvous method is chosen as the primary means of reaching the moon--with the use of the advanced Saturn--it may very well be desirable to develop the Nova as well. First of all, the Nova would be a desirable backup in case the development of rendezvous techniques should not proceed as rapidly as its advocates believe. But, secondly, we shall be needing a vehicle of Nova size in any case for advanced missions beyond the flight to the moon.

One possible approach might be to develop the advanced Saturn at highest priority, with rendezvous as the primary method of propulsion to the moon. The Nova could be developed in parallel, but not at the same pace.

Everything I have said about the program so far involves liquid-propelled rockets. The national decision taken earlier this year provided for parallel development of solid-propellant rocket boosters as well. Research and development of these large solid-propellant rockets are being carried out by the U. S. Air Force.

It must be apparent from the program I have outlined that much work needs to be done --by government, by industry, by universities, and by other private organizations--if we are to accomplish the national goal of a landing on the moon.

Vice President Lyndon B. Johnson expressed the philosophy that must guide our efforts in space last month at the American Rocket Society meeting in New York. He said: "The future of this country and the welfare of the free world depend upon our success in space. There is no room in this country for any but a fully cooperative, urgently motivated all-out effort toward space leadership.

"No one person, no one company, no one Government agency has a monopoly on the competence, the missions, or the requirements for the space program. It is and it must continue to be a national job."

It is up to all of us to get on with that job.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: IMMEDIATE RELEASE
Tuesday, November 28, 1961

RELEASE NO. 61-263

APOLLO CONTRACTOR SELECTED

The National Aeronautics and Space Administration today announced selection of North American Aviation, Inc., to design and build a three-man Apollo spacecraft leading toward eventual lunar landings and exploration of the moon.

The initial phase of the Apollo program, as it involves North American, is expected to exceed $400 million. Contractual details will be worked out by NASA and officials of North American in negotiations scheduled to start within a week.

The magnitude of the Apollo project was recognized by President Kennedy in a message to Congress last May. He said:

"No single space project will be more exciting, or more impressive, or more important for the long-range exploration of space; none will be so difficult or expensive to accomplish."

The Apollo project will be divided into three basic missions:

1) Earth orbital flights -- for testing of spacecraft components and systems, space-crew training and development of operational techniques.

2) Circumlunar flights -- in which the spacecraft crew will perform many of the guidance and control tasks needed on the later lunar landing mission.

3) Manned landing and exploration of the moon -- the final goal of Project Apollo.

Present scheduling calls for earth orbital flights using the Apollo spacecraft during the 1964-65 period, and circumlunar flights and manned exploration of the moon before the end of the decade.

Earth orbital flights will utilize as a launch vehicle the Saturn C-1, which recently had a successful flight test of its first stage.

Circumlunar missions will make use of an advanced version of the Saturn, while manned lunar landing missions will utilize either the Nova vehicle, or the advanced Saturn. In the latter case, spacecraft components would be joined in space through a rendezvous technique now under study. Use of the Nova vehicle would permit launching of the entire spacecraft as one unit.

Design of the Apollo spacecraft will be based on the "building block" or modular concept. There will be three "building blocks" or components in the spacecraft.

One will be the "command center" which will house the three-man crew. The second component will house fuel, electrical power supplies and propulsion units needed for lunar take-off. The third component will contain decelerating rockets intended to gently lower the spacecraft onto the surface of the moon.

North American will be responsible for design and development of two of these components -- the command center and the unit housing fuel, electrical power supply and propulsion units.

North American will be joined in this effort by a large team of sub-contractors.

A separate contract for the third Apollo spacecraft unit, the lunar landing system, is expected to be awarded within six months.

NASA previously selected Massachusetts Institute of Technology's Instrumentation Laboratory as an associate contractor for development of the Apollo guidance and control system.

North American was selected by NASA Administrator James E. Webb following a comprehensive evaluation of five industry proposals.

Other companies submitting proposals were:

General Dynamics Corp., Astronautics Division, in conjunction with the AVCO Corp.

General Electric Co., Missile and Space Vehicle Department, in conjunction with Douglas Aircraft Co., Grumman Aircraft Engineering Corp., and Space Technology Laboratories, Inc.

McDonnell Aircraft Corp., in conjunction with Lockheed Aircraft Corp., Hughes Aircraft Co., and the Vought Astronautics Division of Ling-Temco-Vought Corp.

The Martin Co.

In July of this year, 16 firms were invited to submit proposals on the Apollo spacecraft project.

Five proposals, representing individual or combined efforts of 10 of the 16 firms, were submitted early in October.

Each of these proposals were evaluated by a team of nearly 200 engineers and scientists representing both the National Aeronautics and Space Administration and the Department of Defense.

All phases of Project Apollo, embracing both the spacecraft and the launch vehicle, will be under the over-all direction of D. Brainerd Holmes, NASA's newly-appointed Director of Manned Space Flight. The Apollo spacecraft effort will be managed by Robert R. Gilruth, director of NASA's Manned Spacecraft Center, now located at Langley Field, Va., but which soon will be relocated at Houston, Texas.

\- END -

Project: Mercury Scout

Project Direction: NASA

Launched: November 1, 1961
10:32 AM, EST

From: Atlantic Missile Range

Lifetime: Not applicable

Major Objectives: Place satellite in Earth orbit to test Mercury tracking and communications facilities

Major Results: Orbit not achieved

S-61-32

Flight Program

Launch Vehicle: Scout. Stages (all solid propellant): (1) Algol (2) Castor - a modified sergeant motor (3) Antares - scaled up version of fourth stage (4) Altair - modified X-248 Vanguard third stage.

Lift-Off Weight: 36,600 lbs.

Dimensions: 72 ft. high; 40 in. base diameter

Program: Place satellite in elliptical Earth orbit

Program Results: Launch vehicle deviated from planned flight path and was destroyed by Range Safety Officer after approximately 30 seconds flight.

Perigee (Miles): Not applicable

Apogee (Miles): Not applicable

Inclination: Not applicable

Period: Not applicable

Velocity: Not applicable

Payload And Instrumentation

Dimensions: 12 x 12 x 17 in.

Payload Weights: 150 lbs., to remain attached to spent fourth stage casing.

Payload Configuration: Rectangular

Instrumentation: Transmitters and associated electronics.

Transmitters: C- and S-band radar beacons, two telemetry transmitters, two command receivers, two minitrack beacons.

Power Supply: Chemical batteries

Additional Data:

Sources: NASA

Date: November 6, 1961

Office of Public Information, U.S. National Aeronautics and Space Administration, Washington 25, D.C.

Project: Discoverer XXXIV
1961 Alpha Epsilon

Project Direction: U. S. Air Force

Launched: November 5, 1961
3 p.m., EST
From: Vandenberg AFB, Calif.

Lifetime: 5 mos., estimated

Major Objectives: Reliability testing of Agena "B", improvement of orbital period control; ejection and recovery of capsule.

Major Results: Orbit Achieved. Capsule not recovered, due to on-orbit malfunction.

S-61-33

Flight Program

Launch Vehicle: Thor Agena. Stages: (1) Modified Thor booster
(2) Agena B.

Lift-Off Weight: 115,500 lbs.

Dimensions: 81 ft. high; 8 ft. base diameter

Program: Place satellite in near-polar Earth orbit and recover capsule.

Program Results: Orbit achieved. Capsule not recovered.

Perigee (Miles): 134
Apogee (Miles): 637

Inclination: 82.67°
Period: 97.2 mins.

Velocity: 17,500 (average)

Payload And Instrumentation

Dimensions: Second stage and capsule:
25 ft. high, 5 ft. diameter

Payload Weight: 2,100 lbs. (Approx.), including second stage casing and 300 lb. reentry capsule, retrorockets and recovery aids.

Payload Configuration: Cylindrical

Instrumentation: Instruments for testing of adjustments made as a result of deficiencies found in previous Discoverers.

Transmitters: Not available

Power Supply: Not available

DISCOVERER XXXIV

Additional Data:

Sources:
U.S.A.F., Department of Defense **Date:** November 8, 1961

Prepared by Office of Public Information, U.S. National Aeronautics and Space Administration, Washington 25, D.C.

Project: Discoverer XXXV
1961 Alpha Zeta

Project Direction: U.S. Air Force

Launched: November 15, 1961
4:23 p.m., EST

From: Vandenberg AFB, Calif.

Lifetime: Three months (estimated)

Major Objectives: Test design changes; gather radiation data; obtain data for design of future spacecraft; orbit, eject and recover capsule.

Major Results: Orbit achieved. Capsule ejected and retrieved in pre-planned recovery area.

S-61-34

Flight Program

Launch Vehicle: Thor Agena: Stages; (1) Modified USAF Thor booster
(2) Agena B

Lift-Off Weight: 115,500 lbs.

Dimensions: 81 ft. high; 8 ft. base diameter.

Program: Place satellite in near-polar Earth orbit and recover capsule.

Program Results: Orbit achieved and capsule retrieved.

Perigee (Miles): 147.2
Apogee (Miles): 173.4

Inclination: 81.63°
Period: 89.76 min.

Velocity: 17,500 mph, average

Payload And Instrumentation

Dimensions: Second stage and capsule: 25 ft. high, 5 ft. diameter

Payload Configuration: Cylindrical

Payload Weight: 2,100 lbs. (approx.), including second stage casing and 300-lb. reentry capsule, retro-rockets and recovery aids.

Instrumentation: Devices to measure voltages, pressures and other performance factors to evaluate design changes; experiments to aid in future design work; radiation equipment.

Transmitters: Not Available

Power Supply: Not Available

Additional Data:

Sources:
USAF, Department of Defense

Date: November 17, 1961

DISCOVERER XXXV

Project: Transit IV-B
1961 Alpha Eta

Project Direction: U. S. Navy

Launched: November 15, 1961
5:25 p.m., EST

From: Atlantic Missile Range

Lifetime: Five years (estimate)

Major Objectives: Orbit two satellites to: 1.*(Transit)-Develop all-weather navigation system, investigate Earth's shape; 2.*(TRAAC)-Test gravity system for satellite attitude control, obtain data on inner Van Allen belt.

Major Results: Orbits achieved.

*(See payloads 1. and 2. below)

Flight Program

Launch Vehicle: Thor-Able-Star. Stages: (1) Modified USAF Thor IRBM; (2) USAF Able-Star liquid engine with re-start capability.

Lift-Off Weight: 120,000 lbs.

Dimensions: Over 79 ft. high; 8 ft. base diameter.

Program: Place satellites in near-circular Earth orbit.

Program Results: Orbits achieved.

Perigee (Miles): 1. 582 2. 562

Apogee (Miles): 1. 700 2. 720

Inclination: 1. 32.42° 2. 32.43°

Period: 1. 105.6 min. 2. 105.6 min.

Velocity: 1. and 2. 17,500 mph (Average)

Payload And Instrumentation

Dimensions: 1. 43 in. diameter, 31 in. high; 2. 43 in. diameter, 16 in. high

Payload Weights: 1. and 2. 200 lbs. ea.

Payload Configuration: 1. Drum
2. door-knob

Instrumentation: 1. Stable oscillators, continuous transmitters, phase modulators, memory system and clock; 2. Gravity gradient stabilization equipment, satellite design experiments, back-up for parts of Transit experiments, particle detectors.

Transmitters: 1. Four transmitters.
2. One transmitter.

Power Supply: 1. SNAP, solar cells, Nickel-cadmium battery.
2. Solar cells, Nickel-cadmium battery.

Additional Data: Transit IV-B carries nuclear non-fissionable power supply (SNAP), furnishing current for two transmitters.

Sources: U.S. Navy, Department of Defense

Date: November 21, 1961

TRANSIT IV-B

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RELEASE NO. 61-270

SPACE ACTIVITIES SUMMARY

MERCURY-ATLAS V

S-61-36

Project: Mercury-Atlas V (MA-5)
1961 Alpha Iota

Project Direction: NASA

Launched: November 29, 1961
10:07 AM, EST

From: Atlantic Missile Range

Lifetime: Down 1:28 PM, EST, Nov. 29, 1961

Major Objectives: Orbit Mercury Spacecraft carrying chimpanzee to test all Mercury systems.

Major Results: Orbit achieved. Spacecraft commanded down after two orbits due to development of abnormal roll rate.

Flight Program

Launch Vehicle: Atlas D

Lift-Off Weight: 260,000 lbs., (approx.)

Dimensions: 93 ft. high, including spacecraft and recovery system.

Program: Place spacecraft in Earth orbit and recover in pre-planned area.

Program Results: Orbit achieved.

Perigee (Miles): 99.6
Apogee (Miles): 147.5

Inclination: 32.5°
Period: 88.5 min.

Velocity: 17,500 MPH (average)

Payload And Instrumentation

Dimensions: 9 ft. 6 in. high; 6 ft. base diameter.

Payload Weights: 4100 lbs. (liftoff)
2900 lbs. (in orbit)
2400 lbs. (recovery)

Payload Configuration: Bell-shaped

Instrumentation: Four cameras, six radiation measurement packs, 78 temperature measurement instruments, two play-back tape recorders.

Transmitters: Not available

Power Supply: Chemical batteries

Additional Data: Capsule carrying chimpanzee "ENOS" landed at about 1:28 PM, EST and was picked up by U.S.S. STORMES at about 2:53 PM. Preliminary data indicated chimp satisfactorily performed in-flight psychomotor tasks and was in normal condition on retrieval.

Sources: NASA

Date: November 29, 1961

MERCURY-ATLAS V